



## **LAPORAN PROJECK**

### **INSTANT DRINK CHILLER**

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## **ABSTRACT**

An instant drink chiller is a new product that's been designed overseas. According to our research, Malaysians are still using the traditional way to chill their drinks by using a fridge or an ice bucket, although this is an efficient way it is still very much time consuming and not economical. The main issue in the process of cooling is the time taken to cool a drink to optimum temperature. Traditionally, we use a fridge or otherwise we throw a can/bottle into a bucket of ice to chill our drinks but this process takes approximately 54 minutes to reach 11.5 °C which is the optimum temperature for most drinks. The objective of our project is to be able to chill a drink within a minute. To have a machine that is portable to have chill drinks instantly anywhere. Spinning is the main method in our project in order to achieve the chillness in the beverage. The spinning moves the warm liquid in the middle of the bottle or can to outer wall. This cools the liquid in the bottle or can as it bathes in ice water. As it continuously spins for 1 minutes it speeds up the cooling process. As a conclusion for our abstract, we can make this product better by adding more features via enhancing its performance function. Therefore, the findings and research that we have conducted for this study would bring a lot of benefits to people from all categories.

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# CHAPTER 1

## INTRODUCTION

### 1.1 RESEARCH BACKGROUND

The water that is essential for human life yet needs vary by individuals and it is the body's principal chemical component that makes up about 60 percent of body weight. Everyday people lose water through breath, perspiration, urine and bowel movements. Humans rely on it as their beverage for millions of years. Milk came next, with the advent of agriculture and the domestication of animals. Then beer and wine, coffee and tea, all drinks for taste and pleasure as much as the fluids provide. The newcomers, soft drinks, sports and energy drinks, and the likes of hydration but with a healthy dose of unnecessary calories.

On any given day, 76 percent of individuals age 2 years old and over drink mostly plain water. Research from Department of Statistics Malaysia portal, value that gross output for the second largest contributor was beverages services with RM 8.8 billion (10.7%). This lightly shows that beverages are widely expanded in Malaysia. Thus, The National Academics of Sciences, Engineering and Medicine determined that an adequate daily fluid intake is 3.7 litres of fluids for men and 2.7 litres of fluids for women a day.

Furthermore, a beverage is only a normal beverage when it's not chilled, nothing special and not delicious and enjoyable. But when it is a cold beverage, the taste is sublime with fusion of the sweetness and coldness. It helps you feel energized and refreshed. Cold water helps to cool our core body temperature. When you are running a fever, or when you are trying to lose weight. From the statistics of study presents the percentage distribution of the volume of cold beverages consumed out-of-home in 2018 by type. Beer accounted for 35.2 percent of all drinks while water amounted up to 32.7.

Hence, the idea comes from these two scenarios that is the point of people drinking a lot of beverages and for the need of cold beverages to quench themselves from exhaustion from hot surroundings countries like Malaysia. From the statistics given, it is shown Malaysians drink a lot of beverages, as they need something to chill their beverages even quicker than putting it in a freezer that needs at least 15-30 minutes to get the beverage cold. To solve that problem, we decided to create this new product as a point to make it easy for people who likes to consume chill beverages. Drinking a cold beverage while we're thirsty and exhausted, enlightens our mood and freshness will come with soul.

## **1.2 PROBLEM STATEMENT**

Most of the time, the main reason someone reaches in for a chill drink is during a hot sunny day to have their thirst quenched by a nice chill drink but what could be worse than having your expectations ruined by a lukewarm beverage. Yes, you can always chill it by letting it chill in the fridge. But it comes at a cost of the time of the cooling process.

The main issue in the process of cooling is the time taken to cool a drink to optimum temperature. Traditionally we use a fridge or otherwise we place a can/bottle into a bucket of ice to chill our drinks but this process takes time, approximately 54 minutes to reach a temperature 11.5 °C which is the optimum temperature for most beverages.

## **1.3 RESEARCH OBJECTIVES**

*The objectives to this research are:*

- i. To create a product which is capable of chilling drinks instantly.
- ii. To create a machine which is capable of saving energy and water.
- iii. To create a portable machine to have chill drinks anytime and anywhere.

## **1.4 RESEARCH QUESTIONS**

*This study will answer the following research questions:*

- i. Will it be possible to create an instant chiller that chills beverages in 1-5 minutes?
- ii. What type of material can be used to create a portable chiller?
- iii. What is the method used to create this product?

## **1.5 SCOPE OF RESEARCH**

*The scopes and limits to this research are:*

- I. This product could be costly to build and to manufacture
- II. This product might not be energy-savvy
- III. It would not be able to last for a long time with improper maintenance
- IV. This product would not be a cheap budget for many users in the market
- V. It could be dangerous to operate for people of younger age

## **1.6 SIGNIFICANCE OF RESEARCH**

Although this instant drink chiller product is found in countries overseas, it has the potential to be brought into our country, so that we can make it better by adding more features via upgrading it and enhancing its performance functionality. However, many people from many layers of society may not be able to afford these products due to its pricing range which may vary from RM200-RM300, which is clearly a steep price for this product. Therefore, the findings and research that we have conducted for this study would bring a lot of good and benefits to all the people from all categories.

## **1.7 DEFINITION OF OPERATIONAL TERMS**

- Stainless Steel - A metal that can last long, it is corrosion-resistant, toxic-free, and it is durable as well.
- DC Motor - A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy.
- 12V battery - A source of power to generate energy that allows the motor to function and supply power to the electrical circuit.
- Polyethylene  
( Ice Box ) - Polyethylene is a lightweight, durable thermoplastic with variable crystalline structure.
- Toggle Switch - Toggle switches are actuated by moving a lever back and forth to open. or close an electrical circuit.
- Analog Timer - A analog timer is a specialized type of clock used for measuring specific time intervals. Timers give an indication that the time interval that had been set has expired.
- Water Pump - The use of water pump is to transport water from one place to other pump, via electrical energy.

## **1.8 CHAPTER'S SUMMARY**

In this chapter, the studies were explained about the beginning of the ideas and inspirations of this project. All the objectives were created out of all the problem statements. The objective for this project along with the importance will be an easy-to-operate, energy-savvy, and mobile instant chiller that will be cost-effective, causing it to be more affordable for people from around the country and of all ages to use. Thus, this new portable instant chiller could be used for our daily routines with excellent maintenance and care to last for a long time.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

A refrigerator (colloquially fridge) consists of a thermally insulated compartment and a heat pump (mechanical, electronic or chemical) that transfers heat from the inside of the fridge to its external environment so that the inside of the fridge is cooled to a temperature below the room temperature. Refrigeration is an essential food and beverage storage in developed countries. The lower temperature lowers the reproduction rate of bacteria, so the refrigerator reduces the rate of spoilage. A refrigerator maintains a temperature a few degrees above the freezing point of water. A similar device that maintains a temperature below the freezing point of water is called a freezer. The refrigerator replaced the icebox, which had been a common household appliance for almost a century and a half.

The first cooling systems for food and beverages involved ice. Artificial refrigeration began in the mid-1750s, and developed in the early 1800s. In 1834, the first working vapor-compression refrigeration system was built. The first commercial ice-making machine was invented in 1854. In 1913, refrigerators for home use were invented. In 1923 Frigidaire introduced the first self-contained unit. The introduction of Freon in the 1920s expanded the refrigerator market during the 1930s. Home freezers as separate compartments (larger than necessary just for ice cubes) were introduced in 1940. Frozen foods and drinks, previously a luxury item, became commonplace.

Freezer units are used in households and in industry and commerce. Commercial refrigerator and freezer units were in use for almost 40 years prior to the common home models. The freezer-on-top-and-refrigerator-on-bottom style had been the basic style since the 1940s, until modern refrigerators broke the trend. A vapor compression cycle is used in most household refrigerators, refrigerator-freezers and freezers. Newer refrigerators may include automatic defrosting, chilled water, and ice from a dispenser in the door.

Domestic refrigerators and freezers for food storage are made in a range of sizes. Among the smallest are Peltier-type refrigerators designed to chill beverages. A large domestic refrigerator stands as tall as a person and may be about 1 m wide with a capacity of 600 L. Refrigerators and freezers may be free-standing, or built into a kitchen. The refrigerator allows the modern household to keep food fresh, and furthermore, chill and provides cold yet refreshing beverages.

During our modern era that is constantly flourishing with the inventions of new technology, developments have successfully been created to give an advantage point to users for refrigeration. Refrigeration for drinks and beverages for many kinds have been made easy as our instant chiller is portable, reasonably-priced, and as well as energy-savvy.

## 2.2 Materials Used in A Basic Refrigeration Unit

### 2.2.1 Introduction

Refrigerators today consist of several basic components: the exterior cabinet and door, the inner cabinet or liner, the insulation inserted between the two, the cooling system, the refrigerant, and the fixtures. The cabinet and door are made of aluminium or steel sheet metal that is sometimes pre-painted. The metal is generally purchased in a coil that is either fed directly into the manufacturing process or cut to size and fed sheet by sheet. The inner cabinet is made of sheet metal, like the outer cabinet, or of plastic. The insulation that fills the gap between the inner and outer cabinets consists of fiberglass or polyfoam. The components of the cooling system (compressor, condenser, coils, fins) are made of aluminium, copper, or an alloy. The tubing is usually copper, because of that metal's ductility—its ability to bend without breaking. Freon remains the most commonly used refrigerant, and almost all of the large interior fixtures (door and cabinet liners) are made from vacuum-formed plastic.

### 2.2.2 Characteristics of Materials Used (Aluminium, Sheet Metal)

#### 2.2.2. Advantages of Aluminium and Sheet Metal

Aluminium is an excellent heat and electricity conductor and in relation to its weight is almost twice as good a conductor as copper. Aluminium is a very thin type of metal in general, but is still durable and completely impermeable. Moreover, the metal itself is non-toxic and odourless and as well as it being an excellent sound absorber. Aluminium is 100% recyclable, making this metal eco-friendly for the environment. Whereas for sheet metal, sheet metals are capable of withstanding any sort of pressure without collapsing. By applying surface treatment and finishing to the finished parts, they can be resistant to corrosion, sun, and moisture and are ideal to be used in products that will be exposed to various temperatures, such as hot, cold or warm temperatures as well.

### 2.3 METHODS OF MAKING A REFRIGERATOR

*Outer cabinet and door*

- 1 Pieces of sheet metal are either welded or clinched together. Clinching is a process closely resembling stapling in that the two pieces are crimped together under pressure, though no additional pieces such as staples are added. If the part of the cabinet is to be visible, it will be welded and ground down to appear as one piece. The extent to which the welding process is automated depends on the company and the number of refrigerators being produced.
- 2 If the sheet metal was not purchased in precoated form, it is now painted. Some manufacturers use spray equipment to lay a uniform coat of paint on the metal. Others dip the parts in a paint/solvent mixture before heating them to bake the paint onto the surface.

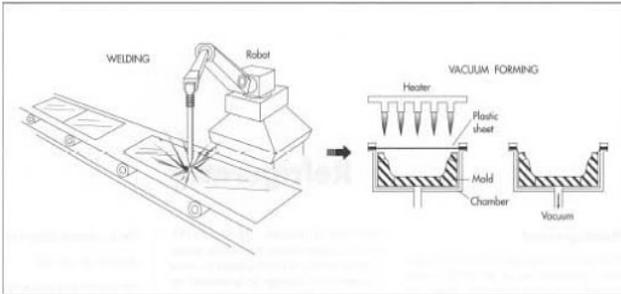


Figure 2.3.1 – Welding Process

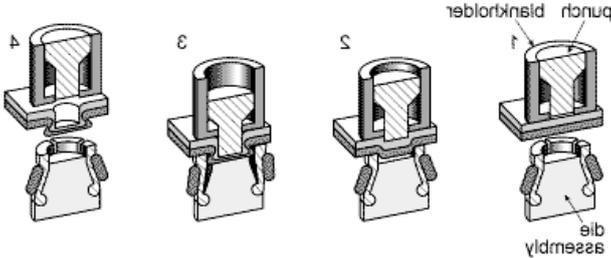


Figure 2.3.2 – Clinking Process

### Inner cabinet

- 3 The inner cabinet is sometimes made from sheet metal very similar to the outer shell. Any seams are caulked to improve insulation and looks. Some manufacturers and some models use plastic for inner liners; for example, the inner door is almost exclusively made from plastic today. The plastic liners are vacuum formed. In this process, a thick piece of plastic slightly larger than the finished part has its outer edges clamped and is then heated. The hot plastic is next pulled by vacuum into a mold and cooled. After trimming, the resulting part is ready for assembly.
- 4 The inner cabinet is inserted into the outer cabinet, and the two are snapped together before the fixtures are inserted. Some tubes and wires are run through the gap between the

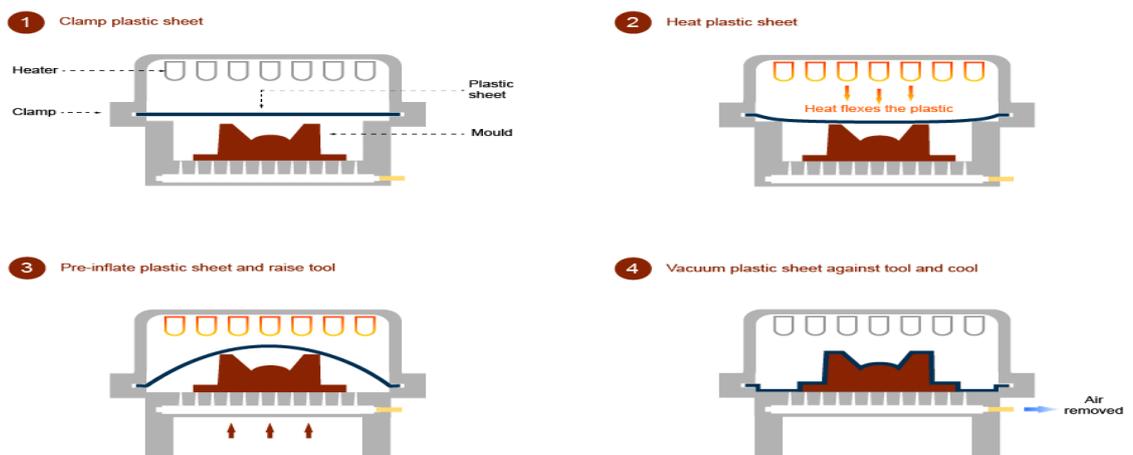


Figure 2.3.3 – Vacuum Forming Process

- 4 The inner cabinet is inserted into the outer cabinet, and the two are snapped together before the fixtures are inserted. Some tubes and wires are run through the gap between the two before it is filled with insulation. A dispensing device (sometimes robotically operated, sometimes a manually operated long 'gun') inserts foam between the walls. When heated in an oven, this foam expands to add rigidity and insulation to the cabinet. A similar process is used for the doors.

### Cooling system

- 5 The refrigeration components are attached to the cabinet using screws and clips. The tubing is soldered together, and a protective coating is sprayed on the joints. The order of this assembly varies between manufacturers and models. The copper tubing from which the coils (condensers and evaporators) have separately been cut, bent, and soldered is then attached to the refrigerator as a unit.
- 6 The seal on the refrigerator door is created by means of magnet laden gaskets that are attached to the doors with screws. Handles and hinges are also screwed onto the door before its hinges are screwed onto the cabinet. Some adjustment is allowed for proper operation of the door.

## **2.4 MATERIAL SELECTION**

### **STAINLESS STEEL**

Resistance to corrosion and staining, low maintenance, and familiar luster make stainless steel an ideal material for many applications where both the strength of steel and corrosion resistance are required. Moreover, stainless steel can be rolled into sheets, plates, bars, wire and tubing. These can be used in cookware, cutlery, surgical instruments, major appliances, construction material in large buildings, industrial equipment (e.g., in paper mills, chemical plants, water treatment), and storage tanks and tankers for chemicals and food products.

The corrosion resistance, the ease with which the material can be steam-cleaned and sterilized, and absence of the need for surface coatings have prompted the use of stainless steel in many applications that are related to industrial, medicine, and as well as daily use for all the people of many categories.

Therefore, for this project, we have decided to use stainless steel as stainless steel does not corrode easily, making it toxic-free. Furthermore, stainless steel can withstand force and pressure so that it can be fitted to our design as it is strong, which does not allow it to deform easily under a certain amount of weight.

### **DC MOTOR**

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor. DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. For our project, we have chosen to use a DC motor since it is 30% more efficient than using an AC motor.

## **POLYETHYLENE (ICE BOX)**

Polyethylene or polythene (abbreviated PE; IUPAC name polyethene or poly(methylene)) is the most common plastic in use today. It is a linear, man-made, addition, homo-polymer, primarily used for packaging (plastic bags, plastic films, geomembranes, containers including bottles, etc.). As of 2017, over 100 million tonnes of polyethylene resins are being produced annually, accounting for 34% of the total plastics market.

## **TOGGLE SWITCH**

A toggle switch is a switch that maintains its state after being activated. A push-to-make, push-to-break switch would therefore be a toggle switch each time you actuate it, whichever state the switch is left in will persist until the switch is actuated again. We have made a decision to use a toggle switch as the switch uses a unique sealing technology, which means it is waterproof, oil-proof and polluting, as well as anti-static, and will not be easily contaminated and interfered. Furthermore, the switch also has good electrical conductivity and as well as small and lightweight being another advantage of it.

## **ANALOG TIMER**

A timer is a specialized type of clock used for measuring specific time intervals. Timers can be categorized into two main types. A timer which counts upwards from zero for measuring elapsed time is often called a stopwatch, while a device which counts down from a specified time interval is more usually called a timer. A simple example of this type is an hourglass. Working method timers have two main groups: Hardware and Software timers. Most timers give an indication that the time interval that had been set has expired. Time switches, timing mechanisms which activate a switch, are sometimes also called "timers."

## **WATER PUMP**

A pump produces liquid movement or flow: it does not generate pressure. It produces the flow necessary for the development of pressure which is a function of resistance to fluid flow in the system. The main purpose of a water pumping system is to move water from one area to another. They are often applied to construction sites as a form of water extraction, assisting in the removal of water when excavating, for example at sewage plants, in flooded areas or when dealing with water wells and oil wells.

## **T-PIPE**

A fitting or adapter is used in pipe systems to connect straight sections of pipe or tube, adapt to different sizes or shapes, and for other purposes such as regulating (or measuring) fluid flow. These fittings are used in plumbing to manipulate the conveyance of water, gas, or liquid waste in domestic or commercial environments, within a system of pipes or tubes. Fittings (especially uncommon types) require money, time, materials, and tools to install, and are an important part of piping and plumbing systems.[2] Valves are technically fittings, but are usually discussed separately.

## **SILICONE PIPE**

Silicone tubing is used in a variety of different ways by several industrial sectors, from electrical sleeving to radiator hoses. The tubing is manufactured in a number of shapes and sizes for different requirements. It has common and not-so common uses. The use of silicone tubing can depend on the size of the tubes. Small tubing is used most commonly as electrical sleeving due to its thin walls and flexibility. Medium sized tubing is used to carry liquids and powders. Large silicone tubing is often employed in air ducts and dielectric applications.

## **CONTROL BOX**

Control boxes typically contain a variety of instruments such as switches, knobs, sliders and buttons. These are connected to the equipment and are used to control it, allowing operators to start, stop or adjust various functions. Control boxes are used to store these electrical components as they cannot be exposed to elements such as water, as these components tend to be hazardous and dangerous if exposed to water and etcetera.

## **WIRE**

The purpose of the wires in a electric circuit is to allow the electricity to flow from one device to the next. Wire is used to carry the flow of electrons. Metal wire is a very good conductor. Materials that do not allow electricity to flow through are called insulators or non-conductors. Wires are essential as they carry the flow of electricity from the power supply to one or a few electrical components via a series or parallel circuit.

## **ANGLE PLATE**

An angle plate is a work holding device used as a fixture in metalworking. Angle plates are used to hold workpieces square to the table during marking out operations. Adjustable angle plates are also available for workpieces that need to be inclined, usually towards a milling cutter. Angle plates are made from high quality material (generally spheroidal cast iron) that has been stabilized to prevent further movement or distortion. Slotted holes or "T" bolt slots are machined into the surfaces to enable the secure attachment or clamping of workpieces to the plate, and the plate to the worktable.

## **PILLOW BLOCK BEARING**

A pillow block bearing consists of a mounting bracket (pillow block) that houses a bearing and is used in low-torque, light load applications. With this configuration, the pillow block is bolted to a foundation, securing it, while the shaft and the inner ring of the bearing are free to rotate. Usually made of grey cast iron, pillow blocks come in two types, split or unsplit. With split pillow blocks the housing element or cap can be separated from the base. An unsplit pillow block is made from one solid piece.

## 2.5 STUDIES OF INSTANT COOLING PROCESS

There is no doubt the invention of the refrigerator has changed the way people store and preserve food and drinks, making it easier for everyone to keep things like milk, juice and fruits and vegetables for extended periods of time. That is the function of a refrigerator, storing food and drinks. It is not a refrigerator's function to cool goods in a quick amount of time. Most cooling units are big and have a lot of storage space, which means fluids cannot cool quickly or at a fast rate. As an example, air conditioning in a room: the larger the room, the longer it will take to lower the temperature.

The first goal of a rapid drink chiller is to significantly reduce the amount of space. This is why we have to make the design of the project fairly compact. At the same time, a useful cooling system has to be provided.

Whether something such as to warm up a cup of coffee or cool down a drink has to be done, either way there is too much of transfer of thermal energy that occurs to do the job. In any hot material, the molecules are moving much faster than the molecules in a cold material, and therefore have a higher kinetic energy. The molecules in a hot cup of coffee have more kinetic energy than the molecules in a cold glass of water.

Rapid drink coolers pass cool water over the aluminium can or glass bottle as a roller spins the container. When cool water passes over the surface of the can or bottle, the water is colder than the surface it's touching. This allows heat energy from the warmer material – the drink container that is chosen to be chilled – to transfer to the colder material: the cool water that passes over the container. The water that passes over the bottle or can is recycled into a compartment filled with ice (which keeps the water at cold temperatures), and the process repeats itself. The machine spins cans or bottles with an electric motor in order to cool the drink evenly.

## **2.6 CHAPTER'S 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 instant drink chiller 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 polyethylene (ice box due to its characteristics and advantages that it provides.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 INTRODUCTION**

What is methodology? 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 flow chart showing the process of making the whole project. Next, is the Gantt Chart, which will show the planning throughout all the 13 weeks of our final year project journey. However, in this chapter, we also will show methods we researched to carry our final year project. Although, these methods have its own pros and cons and it will be explained individually.

Among those methods are injection moulding and spinning. This method has a lot advantages and disadvantages. Hence, in this chapter we will discuss about these methods and the materials we have chosen.

3.2 FLOW CHART

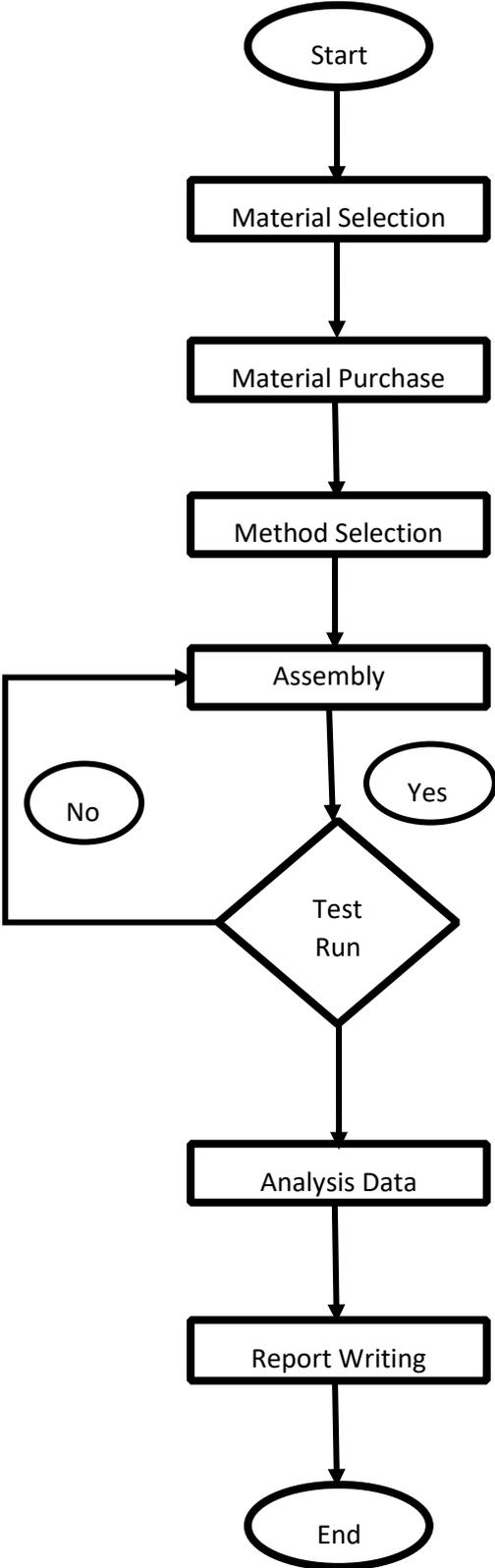


Figure 3.2.1-Flow Chart

### 3.3 MATERIAL SELECTION

The process of material selection is one of the most important processes for this final year project. The main factor of material selection is to discuss and finalize which materials should be used in order to avoid and to prevent time and as well as money wastage. This material selection process needs to be done precisely in order to avoid any encounter with uncalculated risks and problems.

#### (1) ICE BOX



*Figure 3.3.1-ICE BOX*

An icebox (also called a cold closet) is a compact non-mechanical refrigerator which was a common early-twentieth-century kitchen appliance before the development of safely powered refrigeration devices. Before the development of electric refrigerators, iceboxes were referred to by the public as "refrigerators".

Constructed from polyethylene plastic, these ice box coolers also contain a layer of insulation between the outer coatings. They are typically made using Roto-moulded methods, which means the bigger parts of the icebox are formed from one large piece of polyethylene plastic. Because of this, there are fewer gaps which helps prevent the cold from leaking out and keeps external heats absorption to the minimum. The mold continues to rotate at all times to avoid sagging or deformation during the cooling phase.

## (2) DC MOTOR

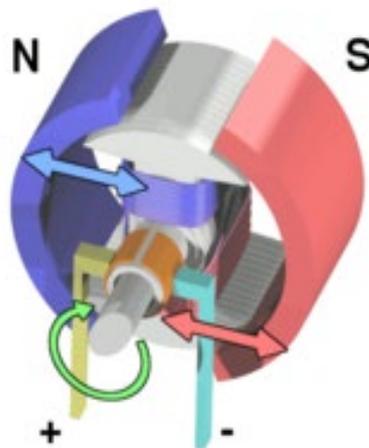


Figure 3.3.2- DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The brushed DC electric motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary magnets (permanent or electromagnets), and rotating electromagnets. A conventional DC motor is formed by an arrangement of coils and magnets that creates motion from electrical power. Stator : The stator consists of either a permanent magnet or electromagnetic windings, and generates a stationary magnetic field around the rotor which occupies the central part of the motor. For our project, we have selected a brushed DC electric motor as the advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. Disadvantages are high maintenance and low life-span for high intensity uses. Brushes are usually made of graphite or carbon, sometimes with added dispersed copper to improve conductivity. Thus, DC motor was used in our project as it provides the high speed needed to rotate the shaft.

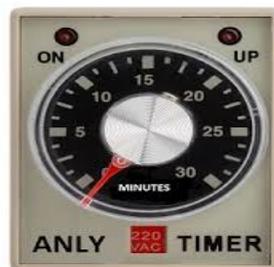
### (3) BATTERY (12V)



*Figure 3.3.3-Battery(12v)*

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. The size of the battery plates and amount of electrolyte determines the amount of charge lead acid batteries can store. The size of this storage capacity is described as the amp hour (AH) rating of a battery. This battery was used in our project as we wanted the instant drink chiller to be portable. A 12v battery is the battery most suitable to be used in this project as it provides sufficient power to support 2 motors and a water pump and also be in a rather compact size.

### (4) ANALOG TIMER



*Figure 3.3.4 -Analog Timer*

A timer is a specialized type of clock used for measuring specific time intervals. Timers can be categorized into two main types. A timer which counts upwards from zero for measuring elapsed time is often called a stopwatch, while a device which counts down from a specified time interval is more usually called a timer. An analog timer was used in this device as the motors have to spin in a specific time to chill the drinks, thus having a timer makes the Instant Drink Chiller more user friendly and convenient to use. The timer is set in a specific a format as it will stop all mechanical movements when the timer runs out.

## **(5) STAINLESS STEEL SHAFT**



*Figure 3.3.5-Stainless Steel Shaft*

Stainless steel is a group of iron-based alloys that contain a minimum of approximately 11% chromium, a composition that prevents the iron from rusting, as well as providing heat-resistant properties. Resistance to corrosion and staining, low maintenance, and familiar luster make stainless steel an ideal material for many applications where both the strength of steel and corrosion resistance are required. The material's corrosion resistance, the ease with which it can be steam-cleaned and sterilized, and the absence of the need for surface coatings have prompted the use of stainless steel in kitchens and food processing plants. Thus, a stainless steel shaft was used being it provides corrosion resistance .....

## **(6) RUBBER RINGS**



*Figure 3.3.6-Rubber Rings*

Rubber rings were used in this project on the steel shaft. The drinks will be placed on the steel shaft for it to rotate, this will cause high friction and slow down the rotation of the drinks thus, rubber rings were placed around the steel shaft to reduce the friction between the shaft and the drinks. The rubber rings are also has high impact absorption which will be able to reduce the rotation impact of the drinks on the shaft.

## (7) TOGGLE SWITCH



*Figure 3.3.7-Toggle switch*

A toggle switch is a type of switch that has a lever that you turn to one side or to the other to make the current flow to one side or to other, or to not flow at all. There are several types of toggle switches. These are characterized by the pole and the throw. A pole represents a contact. The importance of the decision of using a toggle switch for our project is due to the switch being easy to operate, making it easy to operate and as well as it being user-friendly.

## (8) WATER PUMP



*Figure 3.3.8-Water Pump*

Centrifugal pumps operate by transferring energy (angular momentum) from a rotating impeller to the fluid, which is inside a casing. Fluid enters the rapidly rotating impeller along its axis and is cast out by centrifugal force along its circumference through the impeller's vane tips. The action of the impeller increases the fluid's velocity and pressure and also directs it towards the pump outlet. The reason we chose a water pump is because it makes the process of transferring water from the bottom of the icebox to the top to let the beverages bathe with the water easily.

**(9) CONTROL BOX**



*Figure 3.3.9-Control Box*

A control box provides the physical interface to allow an operator to control a piece of equipment and monitor its performance. The reason we decided to use a control box is to place all the sensitive electrical components in a safe place so that it is not exposed to elements such as water.

**(10) ANGLE STEEL**



*Figure 3.3.10-Angle Steel*

An angle plate is a work holding device used as a fixture in metalworking. Angle plates are used to hold workpieces square to the table during marking out operations. Adjustable angle plates are also available for workpieces that need to be inclined. The reason we have decided to use an angle plate is the angle plate helps to support the position of the pillow block bearing that holds the shaft.

## (11) PILLOW BLOCK BEARING



*Figure 3.3.11-Pillow Block Bearing*

A pillow block bearing is a pedestal used to provide support for a rotating shaft with the help of compatible bearings & various accessories. The assembly consists of a mounting block which houses a bearing. The block is mounted to a foundation and a shaft is inserted allowing the inner part of the bearing / shaft to rotate. The reason we decided to use a pillow block bearing is to support the rotating stainless steel shafts.

## (12) PIPE (SILICONE), T-PIPE & U-PIPE



*Figure 3.3.12-Pipes*

A pipe is a tubular section or hollow cylinder, usually but not necessarily of circular cross-section, used mainly to convey substances which can flow liquids. For project, silicone pipe was use as path of water to be flow.

There are some properties that why silicone was chosen. Compared to common organic polymers, silicone rubbers have higher heat resistance and chemical stability. The siloxane bonds (-Si-O-Si) that form the backbone of silicone (dimethyl polysiloxane) are highly stable. At 433 kJ/mol, their binding energy is higher than that of carbon bond (C-C), at 355 kJ/mol.

### (13) WIRE



*Figure 3.3.13-Wires*

A wire is a single usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Stranded wire is composed of a number of small wires bundled or wrapped together to form a larger conductor. Stranded wire is more flexible than solid wire of the same total cross-sectional area. Stranded wire is used when higher resistance to metal fatigue is required.

**3.4 INTERVIEW AND RESEARCH**

**GRAPHICAL ANALYSIS: 51 respondents from this survey**

1. YES- 43 people NO - 8 people

Do you prefer drinking hot water or cold water ?  
51 responses

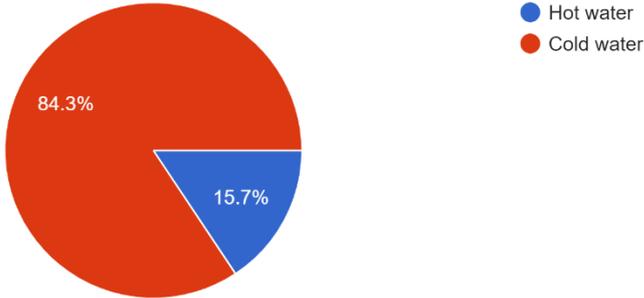


Figure 3.4.1-Result Question 1

2. 1- 9 people 2-9 people 3-6 people 4-5 people 5 or more - 22 people

How many times a day do you drink cold water?  
51 responses

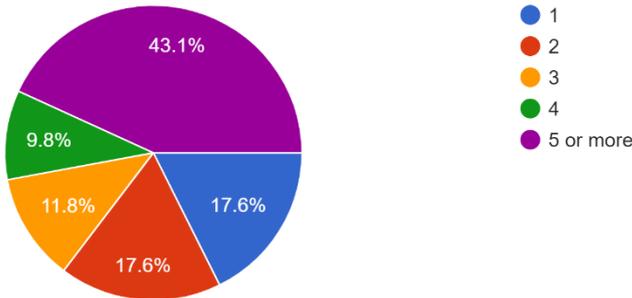


Figure 3.4.2-Result Question 2

3. 15-20min- 8 people 15-30min- 19 people 30-60min- 15 people 60min or more- 9 people

How long does it usually take to cool your drinks in the fridge?

51 responses

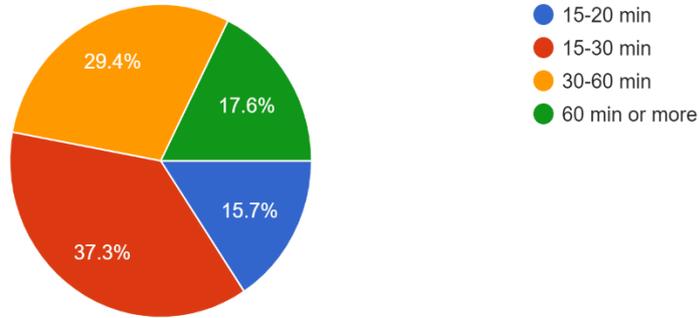


Figure 3.4.3-Result Question 3

4. Strongly Disagree 1-5 Strongly Agree

Do you feel irritated when have to wait for a long time for your drink chill?

51 responses

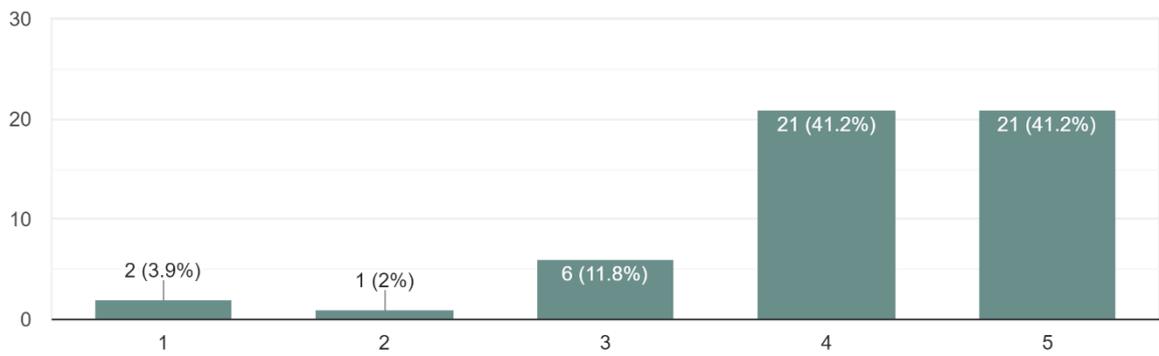


Figure 3.4.4-Result Question 4

5. YES- 46 people NO - 5 people

Are you tired of reaching in for a cool drink but only then to have your expectations ruined by lukewarm drink?

51 responses

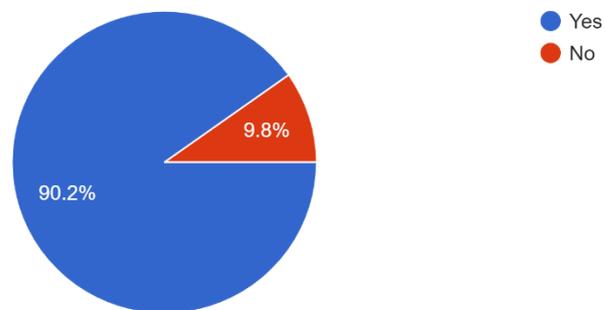


Figure 3.4.5-Result Question 5

6. RM0-RM50 -14 people RM50-RM100 - 22 people RM100-RM150 - 9 people  
RM150-RM200 - 6 people

How much will you pay for a chiller that chills your drinks in 1 minute?

51 responses

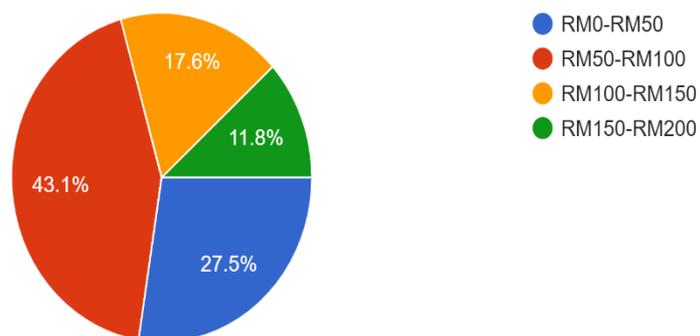


Figure 3.4.6-Result Question 6

7. YES- 44 people NO - 7 people

Do you think a instant drink chiller is useful for you ?

51 responses

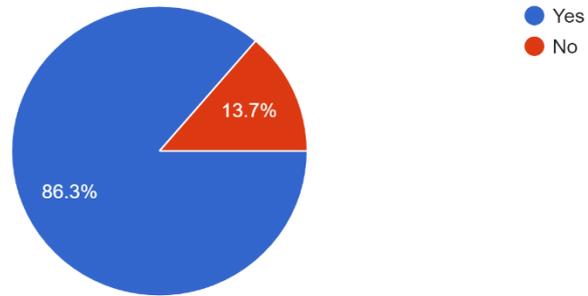
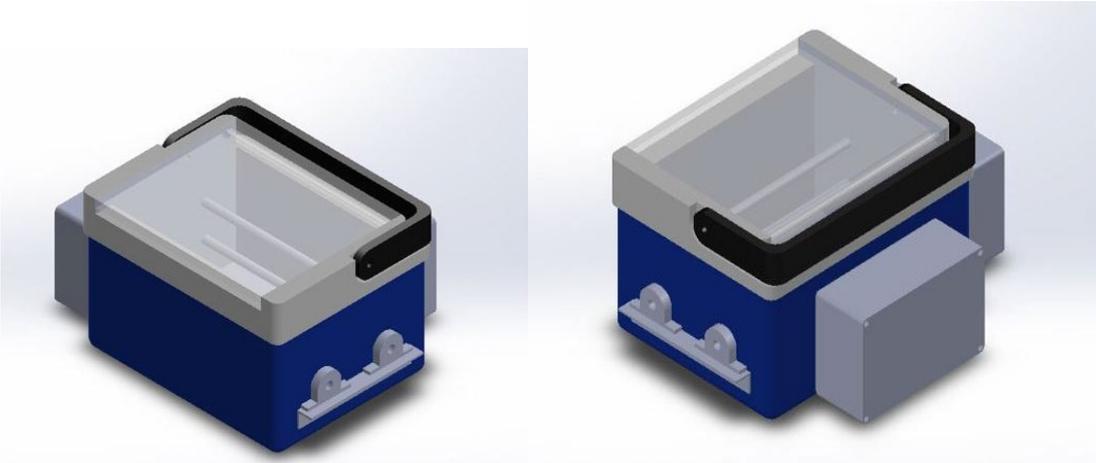


Figure 3.4.7-Result Question 7

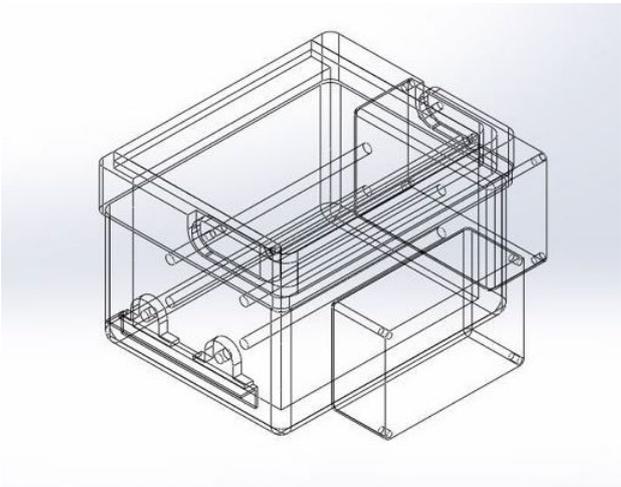
**3.5 PROJECT DESIGN**

**ISOMETRIC VIEW**



*Figure 3.5.1-Isometric view*

**FRONT VIEW**



*Figure 3.5.2-Front View*

# ORTHOGRAPHIC VIEW

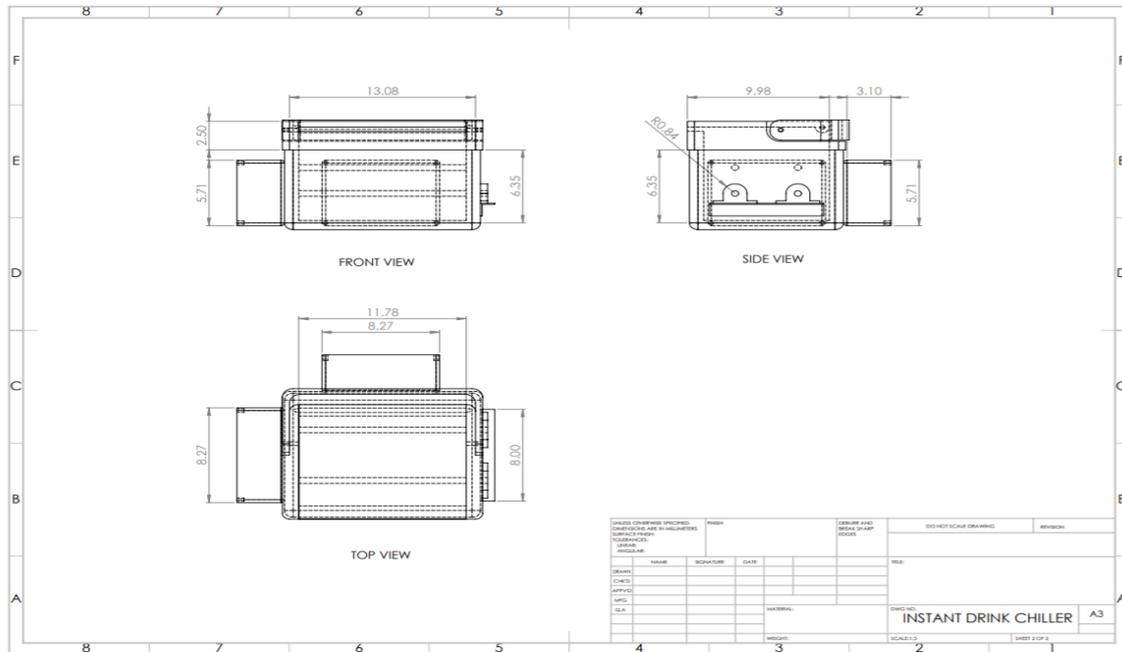


Figure 3.5.3- Orthographic View

### 3.6 OPERATIONAL METHODOLOGY

- **Spinning**

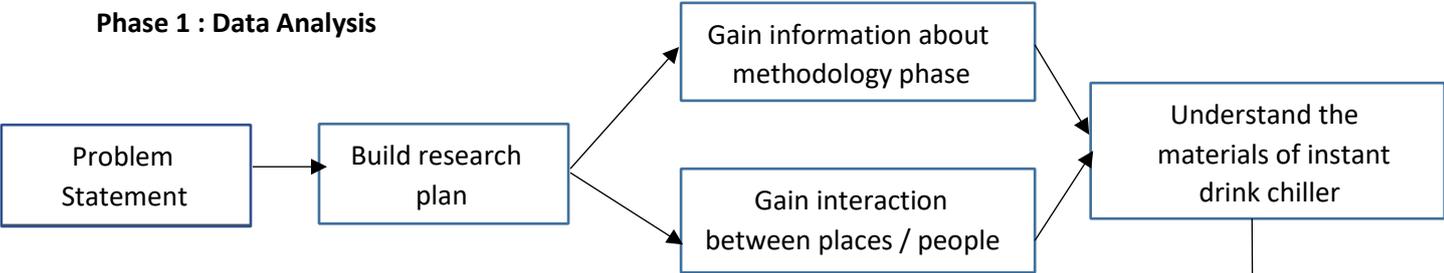
Spinning is the main method in our project in order to achieve the chillness in the beverage in 1-10minutes. The spinning moves the warm liquid in the middle of the bottle/can to outer wall of the bottle/can this cools the liquid in the bottle/can as sits on the ice water. As this continuously spins for 1 minutes it speeds up the cooling process. If you spin a can in a tub of ice, it cools faster, because in spinning the can, you cause convection in the can, while at the same time considerably increasing the surface area of the can that is actually touching ice



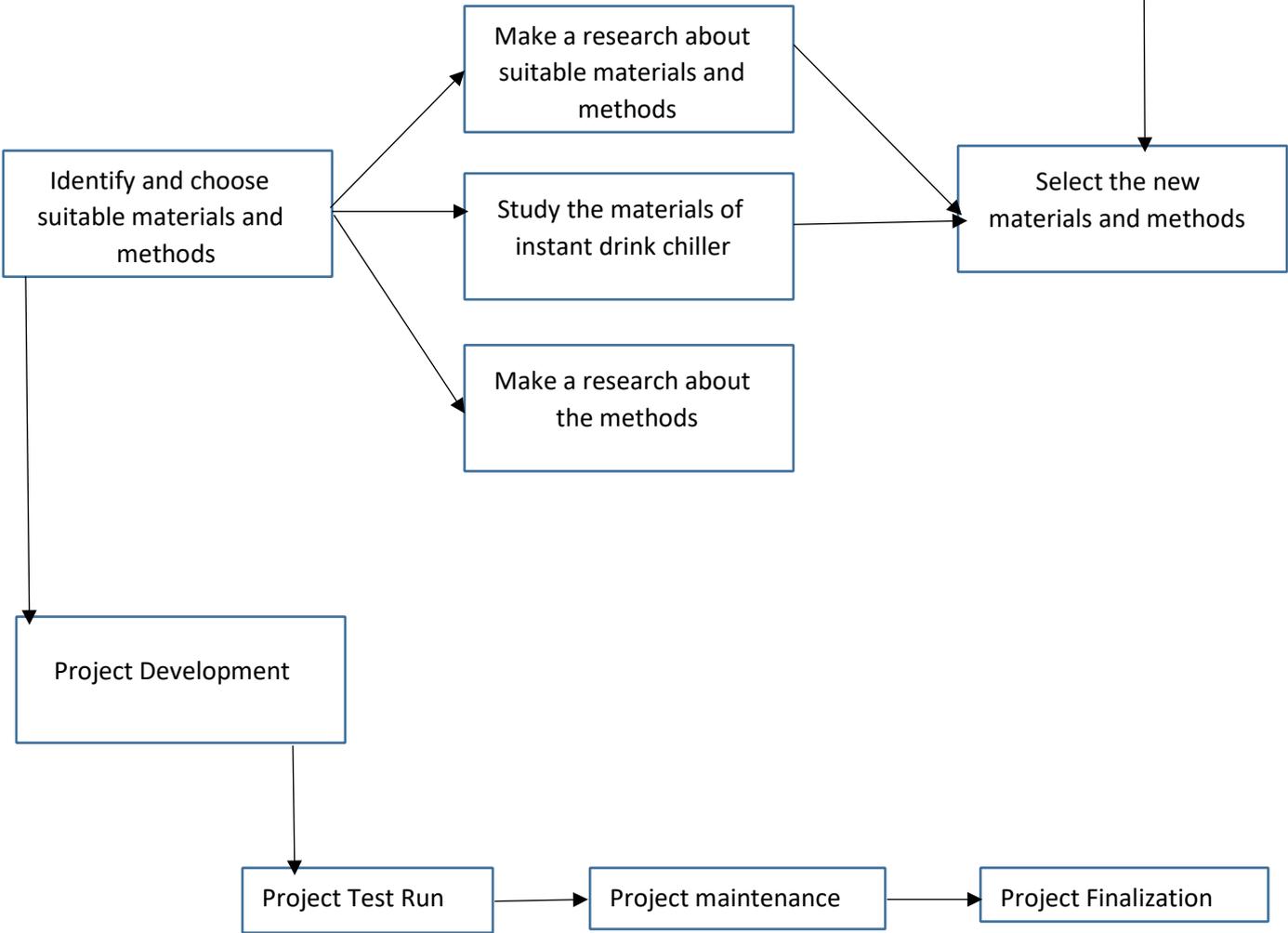
Figure 3.6.1-Spinning

### 3.7 METHODOLOGY PHASE

#### Phase 1 : Data Analysis



#### Phase 2 : Method and Material



### 3.8 BUDGET CALCULATION

<b>NO</b>	<b>MATERIALS / EQUIPMENT</b>	<b>AMOUNT</b>	<b>PRICE</b>
1	ICE BOX	1	RM 53
2	DC MOTOR	2	RM 136
3	BATTERY	1	RM 60
4	ANALOG TIMER	1	RM 30
5	WATER PUMP	1	RM 60
6	TOGGLE SWITCH	1	RM 10
7	T-PIPE	1	RM 2
8	PIPE(SILICON)	2 metres	RM 2
9	STAINLESS STEEL SHAFT	4ft	RM 16
10	CONTROL BOX	2	RM 20
11	WIRES	2 metres	RM 2
12	BESI-L	1ft	RM 8
13	COUPLING BLOCK	2	RM 4
14	U-PIPE	2	RM 4
15	RUBBER RINGS	10	RM 3
16	PERSPEC	5x30	RM 10
<b>TOTAL</b>			<b>RM 414</b>

*Table 3.8.1-Budget Calculations*

### **3.9 DISCUSSION**

From this project, we have learnt how to design a product that has many advantages over disadvantages. These advantages can be maximised efficiently by our society as we have designed this project to be cost effective, safe and also potentially to be a manufactured product for our domestic market so that people from all of over our country can afford this product and make it useful as well. In this process, we have also learnt and carried out research about the concept of spinning that speeds up the process of cooling. We also discussed and decided to use the best materials that to put together a cost-effective, yet a good product. We also faced some challenges during the material selection as to which material is the best for this project. We believe that this is the best method selection, material choice and design to create this product as it will overcome the problem stated. With the approval of our proposal, we executed the plan to carry forward with this project and complete the process of making this project. The inspiration to make this product started by the drive to create an invention that does not make us wait for a long time to enjoy our beverages chilled, as well as looking from another aspect of this product having the potential to be a successful invention to be marketed domestically. By following the right steps and the correct methods, we hope make a successful product with this project.

### 3.10 PROJECT ACTIVITY

Project Activity	weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing and Project Planning	Blue													
	Purple													
Project Design		Blue												
		Purple												
Material Selection			Blue											
			Purple											
Materials Purchase				Blue										
				Purple										
Method Selection					Blue									
					Purple									
Fabrication						Blue	Blue	Blue						
						Purple	Purple	Purple						
Test Run									Blue					
									Purple					
Analysis Data										Blue				
										Purple				
Report Writing											Blue			
											Purple			
Video and Slide making												Blue		
												Purple		
Presentation													Blue	
													Purple	

## **CHAPTER 4**

### **ANALYSIS**

#### **4.1 USAGE METHOD**

The usage method of this product is easily operatable and simplified. This product can be used to chill beverages and drinks by placing them on the shaft of the product, then setting the timer according to the size of beverage. After that, the only thing left is to turn on the product, allowing the Instant Drink Chiller product to operate as desired. When the Instant Drink Chiller operates, it spins the shaft using the DC motors fixed in the product. This allows the beverage in the chiller to spin at a high motion on the steel shafts. As this happens, the water pump in the product pumps water from the water pump through the water hose onto the top of the beverage, therefore allowing heat release from the product.

#### **4.2 ANALYSIS**

Based on the product we created, we successfully manufactured a product and we managed to work with efficiency. The torque that has been calculated to spin the shaft that mounted on pillow block was successfully done for it to work smoothly with the beverage on the shaft. The power source needed was supplied from the battery to the DC motors, timer, switch and water pump. All those components were connected with a parallel series circuit method and the components and wiring were tucked safely in the control box. Water was supplied by the water pump from bottom of the ice box and it will flow to the top via the silicone hoses.

#### **CONCLUSION**

As a conclusion, we can simplify that this whole process of designing the project has taught us how to be innovative and creative with the things that can be found all around us, and as well as to push ourselves to the limit ,to not limit ourselves when it comes to innovation to produce a better and more advanced lifestyle for the future of this society. This project has also taught us discipline and teamwork in order to make this project happen.

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