POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

CANNING MACHINE

NAMA	NO. PENDAFTARAN
AHMAD HUSAINI BINABDUL HALIM	08DMP18F1020
MUHAMMAD HAKIM BIN MOHD SUHAIMI	08DMP18F1010
MUHAMMAD NAIM BIN SUHAIMI	08DMP18F1036

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

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

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : CANNING MACHINE

SESI : JUNE 2020

1. Kami, **1. AHMAD HUSAINI BIN ABDUL HALIM (08DMP18F1020)**
2. MUHAMMAD HAKIM BIN MOHD SALEHEN (08DMP18F1010)
3. MUHAMMAD NAIM BIN SUHAIMI (08DMP18F1036)

Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, 40150, Shah Alam, Selangor**. (selepas ini dirujuk sebagai 'Politeknik tersebut').

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

Diperbuat dan dengan sebenar-benarnya diakui

Oleh yang tersebut;

a) AHMAD HUSAINI BIN ABDUL HALIM	)	…….
(No. Kad Pengenalan: 000115-04-0089)	)	AHMAD HUSAINI
b) MUHAMMAD HAKIM BIN MOHD	)	…….
SALEHEN		
(No. Kad Pengenalan: 000126-01-0221)	)	MUHAMMAD HAKIM
c) MUHAMMAD NAIM BIN SUHAIMI	)	…….
(No. Kad Pengenalan: 000626-02-0303)	)	MUHAMMAD NAIM

Di hadapan saya, KHAIRULNIZAM BIN KASIM (700720105255)	)	…….
sebagai penyelia projek pada tarikh: 4/6/2019	)	KHAIRULNIZAM BIN KASIM

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With this we are grateful to Allah SWT so this final project is ready. We hope that this report can be used as an example and guide to the relevant parties in the future.

ABSTRAK

Home Canning Machine merupakan mesin pengetinan yang diolahkan daripada mesin pengetinan industri besar .Ianya merupakan mesin yang diubah suai untuk memudahkan industri kecil dan sederhana (IKS) melakukan proses pengedapan tin serta memasarkan produk mereka dengan lebih efisien. Pengetinan makanan lazimnya,dilakukan untuk memanjangkan tempoh jangka hayat sesuatu makanan yang biasanya dari satu ke lima tahun, tetapi dalam keadaan-keadaan tertentu boleh jauh lebih lama. Produk bertin ,kering , dan sejuk beku boleh kekal elok dimakan selama 30 tahun. Malangnya, sistem pengetinan masih kurang diambil peduli oleh masyarakat dan industri kerana kurangnya kefahaman tentang kebaikan dan kelebihan pengetinan makanan. Mesin pengetinan ini diciptakan bagi memudahkan proses pengetinan dilakukan dirumah atau di industri kecil. Objektif projek ini adalah mereka bentuk dan membangunkan prototaip sebuah mesin pengetinan yang mesra pengguna dan dapat mengurangkan penggunaan tenaga elektrik dalam melakukan proses - proses pengetinan serta meringankan bebanan kewangan untuk usahawan kecil.Contohnya mesin pengetinan yang ada sekarang kebiasaanya digunakan di industri besar untuk proses pengeluaran yang komersial maka ia tidak sesuai digunakan untuk golongan industri yang kecil dan sederhana.Dengan adanya mesin pengetinan yang kami bangunkan golongan perindustrian kecil dapat meningkatkan produktiviti mereka dan kualiti produk yang mereka hasilkan setaraf dengan industri – industri besar.Seterusnya bahan yang digunakan untuk membuat mesin pengetinan ini terdiri dari jenis keluli tahan karat (ASTM A320 Grade L43 Fasteners) , (ASTM A193 B7) dan aluminium aloi (ASTM B241 Grade 2219).Hal ini kerana jenis - jenis keluli yang dinyatakan mempunyai tahap kekuatan hasil yang tinggi iaitu di antara (710 - 720 MPa) , kekuatan ketahanan haba (400 – 450 celcius) dan kekuatan ketegangan (745 - 860 Mpa) maka terbuktilah bahawa bahan yang digunakan ini sesuai untuk pembuatan mesin pengetinan. Akhir sekali , dengan terciptanya mesin ini golongan industri kecil dapat menjalankan kerja dalam suasana yang kondusif dan sistematik.

KATA KUNCI : MESIN PENGETINAN YANG DIINOVASIKAN

ABSTRACT

Home Canning Machine is a canning machine processed from large industrial canning machines. It is a modified machine to make it easier for small and medium industries (SMIs) to do the process of canning and market their products more efficiently. Food canning is usually done to extend the life span of a food which is usually from one to five years, but in certain circumstances it can be much longer. Tinned, dried, and frozen products can remain edible for up to 30 years. Unfortunately, the canning system is still underestimated by the community and industry due to the lack of understanding of the benefits and advantages of food canning. This canning machine was created to facilitate the canning process to be done at home or in small industries. The objective of this project is to design and develop a prototype of a user-friendly canning machine and to reduce the use of electricity in the process of canning process as well as alleviate financial burden for small entrepreneurs. commercial then it is not suitable for use for small and medium industries. With the canning machines that we develop small industrial groups can increase their productivity and the quality of the products they produce is equivalent to the industry - large industries. consists of stainless steel types (ASTM A320 Grade L43 Fasteners), (ASTM A193 B7) and aluminum alloys (ASTM B241 Grade 2219). 720 MPa), quadruple n thermal resistance (400 - 450 celcius) and tensile strength (745 - 860 Mpa) then it is proven that the material used is suitable for the manufacture of canning machines. Finally, with the creation of this machine, small industries can work in a conducive and systematic environment.

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CHAPTER 1
INTRODUCTION

1.1 RESEARCH BACKGROUND

Canning is the process of applying heat to food that is closed in jars to destroy microorganisms that can cause food spoilage. Proper canning techniques stop this damage by heating food for a certain period of time and killing these unwanted microorganisms. canning process, air is moved from the jar and a vacuum is formed during the jar cools and seals. In addition, canning is a method of food preservation in which food is processed and sealed in an airtight container. Its packaging prevents microorganisms from entering and multiplying in it.

To prevent food being spoiled before and during containment, a number of methods are used: pasteurization, boiling, cooling, freezing, drying, vacuum treatment, natural antimicrobial agents for preserved food recipes, adequate doses of ionizing radiation, immersion in salt, acids, bases , highly osmotic (e.g. highly sugary) or other microbial-challenging environments. No such method is very reliable as a preservative. For example, spores form thermally resistant microorganisms, Clostridium botulinum (causing botulism) can still survive.

From a public safety standpoint, foods with low acidity require sterilization under high temperatures. To reach the temperature above the boiling point requires the use of a pressure can. Foods that must be in a pressure can include most vegetables, meats, seafood, poultry, and dairy products. The only foods that can be stored in cans with plain boiling water are highly acidic foods with a pH below 4.6, such as fruits, pickled vegetables, or other foods that have added acidic additives. The packing process can also affect the texture and sensory properties of canned food. The longer the heating time, the better the texture and sensory properties of canned food.

1.2 PROBLEM STATEMENT

After reviewing the canning machines available in the market, there are some problem statements about canning machines available in the market.

Also, the cost of electricity consumption is high during canning operations. This is because, the canning machine available in the market is automatic where it uses full electric power for operation.

In addition, the canning machines available in the market are less ergonomic due to their size and weight. Furthermore, canning machines on the market are difficult to operate as there are many adjustments that need to be followed and adhered to to ensure the machine can operate properly

1.3 RESARCH OBJECTIVES

The objectives to this research are :

i. Design and develop a prototype of a flexible canning machine.

ii. Save on electricity consumption.

iii. Increase food shelf life.

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

i. Is it possible to create a high quality canning machine ?

ii. What types of materials can be used to make cheap canning machine ?

iii. What are the possibilities of making printing machine is faster?

1.5 SCOPE OF RESEARCH

The scopes and limits to this research are :

I. This product should not be exposed to water frequently.

II. Not suitable for large industries.

III. Using stainless steel to strengthen the structure of the canning machine.

IV. Can last a long time with good care.

1.6 SIGNIFICANCE OF RESEARCH

Although, the canning machine currently used in Malaysia can work well but the machine is only suitable to be applied in large industries and the price offered is very expensive which is worth RM 4000 + then it will burden small and medium industries (SMIs) who just want to start a business Therefore, it is hoped that the findings of this study will bring many benefits to small and medium entrepreneurs who can not afford expensive canning machines.

1.7 CHAPTER'S SUMMARY

In this chapter, the study is explained about the origin of the idea and its inspiration. All objectives are made from all statements of problem. The objective for this project together - with its importance is a canning machine that will be cheap and easy to operate for small and medium industries , and even the scope of this project only focuses on small entrepreneurs. Therefore, this new canning machine can be used to extend the shelf life of food and is expected to improve the quality and level of freshness of food.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Canning is a method of food preservation in which food content is processed and sealed in an airtight container (jars such as Mason jars, and cans and cans). Copying provides a lifespan that typically ranges from one to five years, although in certain circumstances it can be longer. Frozen canned products, such as canned dried lentils, can last for 30 years in an edible condition. In 1974, canned food samples from the wreck of Bertrand, a steamer that sank in the Missouri River in 1865, were tested by the National Food Processors Association. Although the appearance, smell and vitamin content have deteriorated, there is no trace of microbial growth and the 109-year-old food is determined to be safe to eat.

2.2 Canning Machine

Prepared by Ahmad Husaini Abdul Halim

2.2.1 Introduction

French origins

During the first years of the Napoleonic Wars, the French government offered a hefty cash award of 12,000 francs to any inventor who could devise a cheap and effective method of preserving large amounts of food. The larger armies of the period required increased and regular supplies of quality food. Limited food availability was among the factors limiting military campaigns to the summer and autumn months. In 1809, Nicolas Appert, a French confectioner and brewer, observed that food cooked inside a jar did not spoil unless the seals leaked, and developed a method of sealing food in glass jars. Appert was awarded the prize in 1810 by Count Montelivert, a French minister of the interior. The reason for lack of spoilage was unknown at the time, since it would be another 50 years before Louis Pasteur demonstrated the role of microbes in food spoilage.

The French Army began experimenting with issuing canned foods to its soldiers, but the slow process of canning foods and the even slower development and transport stages prevented the army from shipping large amounts across the French Empire, and the war ended before the process was perfected.

Following the end of the Napoleonic Wars, the canning process was gradually employed in other European countries and in the US.

In the United Kingdom

Nicolas Appert, developer of the canning process

Based on Appert's methods of food preservation, the tin can process was allegedly developed by Frenchman Philippe de Girard, who came to London and used British merchant Peter Durand as an agent to patent his own idea in 1810.[5] Durand did not pursue food canning himself, selling his patent in 1811 to Bryan Donkin and John Hall, who were in business as Donkin Hall and Gamble, of Bermondsey.[6] Bryan Donkin developed the process of packaging food in sealed airtight cans, made of tinned wrought iron. Initially, the canning process was slow and labour-intensive, as each large can had to be hand-made, and took up to six hours to cook, making canned food too expensive for ordinary people.

The main market for the food at this stage was the British Army and Royal Navy. By 1817, Donkin recorded that he had sold £3000 worth of canned meat in six months. In 1824, Sir William Edward Parry took canned beef and pea soup with him on his voyage to the Arctic in HMS Fury, during his search for a northwestern passage to India. In 1829, Admiral Sir James Ross also took canned food to the Arctic, as did Sir John Franklin in 1845.[7] Some of his stores were found by the search expedition led by Captain (later Admiral Sir) Leopold McClintock in 1857. One of these cans was opened in 1939 and was edible and nutritious, though it was not analysed for contamination by the lead solder used in its manufacture.

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A Dixie Can Sealer for home use. Now in Thinktank, Birmingham Science Museum.

In Europe

During the mid-19th century, canned food became a status symbol amongst middle-class households in Europe, being something of a frivolous novelty. Early methods of manufacture employed poisonous lead solder for sealing the cans. Studies in the 1980s attributed the lead from the cans as a factor in the disastrous outcome of the 1845 Franklin expedition to chart and navigate the Northwest Passage.[8] However, studies in 2013 and 2016 suggested that lead poisoning was likely not a factor, and that the crew's ill health may, in fact, have been due to malnutrition – specifically zinc deficiency – possibly due to a lack of meat in their diet.[9][10]

Increasing mechanization of the canning process, coupled with a huge increase in urban populations across Europe, resulted in a rising demand for canned food. A number of inventions and improvements followed, and by the 1860s smaller machine-made steel cans were possible, and the time to cook food in sealed cans had been reduced from around six hours to thirty minutes.

In the United States

Canned food also began to spread beyond Europe – Robert Ayars established the first American canning factory in New York City in 1812, using improved tin-plated wrought-iron cans for preserving oysters, meats, fruits and vegetables. Demand for canned food greatly increased during wars. Large-scale wars in the nineteenth century, such as the Crimean War, American Civil War, and Franco-Prussian War, introduced increasing numbers of working-class men to canned food, and allowed canning companies to expand their businesses to meet military demands for non-perishable food, enabling companies to manufacture in bulk and sell to wider civilian markets after wars ended. Urban populations in Victorian Britain demanded ever-increasing quantities of cheap, varied, quality food that they could keep at home without having to go shopping daily. In response, companies such as Underwood, Nestlé, Heinz, and others provided quality canned food for sale to working class city-dwellers. In particular, Crosse and Blackwell took over the concern of Donkin Hall and Gamble. The late 19th century saw the range of canned food available to urban populations greatly increase, as canners competed with each other using novel foodstuffs, highly decorated printed labels, and lower prices.

World War I

Demand for canned food skyrocketed during World War I, as military commanders sought vast quantities of cheap, high-calorie food to feed their millions of soldiers, which could be transported safely, survive trench conditions, and not spoil in transport. Throughout the war, British soldiers generally subsisted on low-quality canned foodstuffs, such as the British "Bully Beef" (cheap corned beef), pork and beans, canned sausages, and Maconochies Irish Stew, but by 1916, widespread dissatisfaction and increasing complaints about the poor quality canned food amongst soldiers resulted in militaries seeking better-quality food to improve morale, and complete meals-in-a-can began to appear. In 1917, the French Army began issuing canned French cuisine, such as coq au vin, Beef Bourguignon, french onion soup and Vichyssoise, while the Italian Army experimented with canned ravioli, spaghetti bolognese, Minestrone and Pasta e fagioli. Shortages of canned food in the British Army during 1917 led to the government issuing large quantities of cigarettes and amphetamines to soldiers to suppress their appetites. After the war, companies that had supplied military canned food sought to improve the quality of their goods for civilian sale.

1914 magazine advertisement for cookware with instructions for home canning

2.3 METHODS OF SEAMING CAN

The original fragile and heavy glass containers presented challenges for transportation, and glass jars were largely replaced in commercial canneries with cylindrical tin can or wrought-iron canisters (later shortened to "cans") following the work of Peter Durand (1810). Cans are cheaper and quicker to make, and much less fragile than glass jars. Glass jars have remained popular for some high-value products and in home canning. Can openers were not invented for another thirty years – at first, soldiers had to cut the cans open with bayonets or smash them open with rocks. Today, tin-coated steel is the material most commonly used. Laminate vacuum pouches are also used for canning, such as used in MREs and Capri Sun drinks.

To prevent the food from being spoiled before and during containment, a number of methods are used: pasteurisation, boiling (and other applications of high temperature over a period of time), refrigeration, freezing, drying, vacuum treatment, antimicrobial agents that are natural to the recipe of the foods being preserved, a sufficient dose of ionizing radiation, submersion in a strong saline solution, acid, base, osmotically extreme (for example very sugary) or other microbially-challenging environments.

Other than sterilization, no method is perfectly dependable as a preservative. For example, the spores of the microorganism *Clostridium botulinum* (which causes botulism) can be eliminated only at temperatures above the boiling point of water.

From a public safety point of view, foods with low acidity (a pH more than 4.6) need sterilization under high temperature (116–130 °C). To achieve temperatures above the boiling point requires the use of a pressure canner. Foods that must be pressure canned include most vegetables, meat, seafood, poultry, and dairy products. The only foods that may be safely canned in an ordinary boiling water bath are highly acidic ones with a pH below 4.6, such as fruits, pickled vegetables, or other foods to which acidic additives have been added.

Double seams

Invented in 1888 by Max Ams modern double seams provide an airtight seal to the tin can. This airtight nature is crucial to keeping micro-organisms out of the can and keeping its contents sealed inside. Thus, double seamed cans are also known as Sanitary Cans. Developed in 1900 in Europe, this sort of can was made of the traditional cylindrical body made with tin plate. The two ends (lids) were attached using what is now called a double seam. A can thus sealed is impervious to contamination by creating two tight continuous folds between the can's cylindrical body and the lids. This eliminated the need for solder and allowed improvements in manufacturing speed, reducing cost.

Double seaming uses rollers to shape the can, lid and the final double seam. To make a sanitary can and lid suitable for double seaming, manufacture begins with a sheet of coated tin plate. To create the can body, rectangles are cut and curled around a die, and welded together creating a cylinder with a side seam.

Rollers are then used to flare out one or both ends of the cylinder to create a quarter circle flange around the circumference. Precision is required to ensure that the welded sides are perfectly aligned, as any misalignment will cause inconsistent flange shape, compromising its integrity.

A circle is then cut from the sheet using a die cutter. The circle is shaped in a stamping press to create a downward countersink to fit snugly into the can body. The result can be compared to an upside down and very flat top hat. The outer edge is then curled down and around about 140 degrees using rollers to create the end curl.

The result is a steel tube with a flanged edge, and a countersunk steel disc with a curled edge. A rubber compound is put inside the curl.

2.3.1

Seaming

Opened can Figure 2.3.1

The body and end are brought together in a seamer and held in place by the base plate and chuck, respectively. The base plate provides a sure footing for the can body during the seaming operation and the chuck fits snugly into the end (lid). The result is the countersink of the end sits inside the top of the can body just below the flange. The end curl protrudes slightly beyond the flange.

First operation

Once brought together in the seamer, the seaming head presses a first operation roller against the end curl. The end curl is pressed against the flange curling it in toward the body and under the flange. The flange is also bent downward, and the end and body are now loosely joined together. The first operation roller is then retracted. At this point five thicknesses of steel exist in the seam. From the outside in they are:

- End
- Flange
- End Curl
- Body

- Countersink

2.3.2 Second operation

The seaming head then engages the second operation roller against the partly formed seam. The second operation presses all five steel components together tightly to form the final seal. The five layers in the final seam are then called; a) End, b) Body Hook, c) Cover Hook, d) Body, e) Countersink. All sanitary cans require a filling medium within the seam because otherwise the metal-to-metal contact will not maintain a hermetic seal. In most cases, a rubberized compound is placed inside the end curl radius, forming the critical seal between the end and the body.

Probably the most important innovation since the introduction of double seams is the welded side seam. Prior to the welded side seam, the can body was folded and/or soldered together, leaving a relatively thick side seam. The thick side seam required that the side seam end juncture at the end curl to have more metal to curl around before closing in behind the Body Hook or flange, with a greater opportunity for error.

Seamer setup and quality assurance

Many different parts during the seaming process are critical in ensuring that a can is airtight and vacuum sealed. The dangers of a can that is not hermetically sealed are contamination by foreign objects (bacteria or fungicide sprays), or that the can could leak or spoil.

One important part is the seamer setup. This process is usually performed by an experienced technician. Amongst the parts that need setup are seamer rolls and chucks which have to be set in their exact position (using a feeler gauge or a clearance gauge). The lifter pressure and position, roll and chuck designs, tooling wear, and bearing wear all contribute to a good double seam.

Incorrect setups can be non-intuitive. For example, due to the springback effect, a seam can appear loose, when in reality it was closed too tight and has opened up like a spring. For this reason, experienced operators and good seamer setup are critical to ensure that double seams are properly closed.

Quality control usually involves taking full cans from the line – one per seamer head, at least once or twice per shift, and performing a teardown operation (wrinkle/tightness), mechanical tests (external thickness, seamer length/height and countersink) as well as cutting the seam open with a twin blade saw and measuring with a double seam inspection system. The combination of these measurements will determine the seam's quality.

Use of a statistical process control (SPC) software in conjunction with a manual double-seam monitor, computerized double seam scanner, or even a fully automatic double seam inspection system makes the laborious process of double seam inspection faster and much more accurate. Statistically tracking the performance of each head or seaming station of the can seamer allows for better prediction of can seamer issues, and may be used to plan maintenance when convenient, rather than to simply react after bad or unsafe cans have been produced.[13]

2.4 Nutritional value

Canning is a way of processing food to extend its shelf life. The idea is to make food available and edible long after the processing time. A 1997 study found that canned fruits and vegetables are as rich with dietary fiber and vitamins as the same corresponding fresh or frozen foods, and in some cases the canned products are richer than their fresh or frozen counterparts.[14] The heating process during canning appears to make dietary fiber more soluble, and therefore more readily fermented in the colon into gases and physiologically active byproducts. Canned tomatoes have a higher available lycopene content. Consequently, canned meat and vegetables are often among the list of food items that are stocked during emergencies.

2.5 Potential hazards

Women working in a cannery

In the beginning of the 19th century the process of canning foods was mainly done by small canneries. These canneries were full of overlooked sanitation problems, such as poor hygiene and unsanitary work environments. Since the refrigerator did not exist and industrial canning standards were not set in place it was very common for contaminated cans to slip onto the grocery store shelves.

2.5.1 Migration of can components

In canning toxicology, *migration* is the movement of substances from the can itself into the contents. Potential toxic substances that can migrate are lead, causing lead poisoning, or bisphenol A (BPA), a potential endocrine disruptor that is an ingredient in the epoxy commonly used to coat the inner surface of cans. Some cans are manufactured with a BPA-free enamel lining produced from plant oils and resins. In February 2018, The Can Manufacturers Institute surveyed the industry and reported that at least 90% of food cans no longer contained BPA.

2.5.2 Salt content

Salt (sodium chloride), dissolved in water, is used in the canning process. As a result, canned food can be a major source of dietary salt. Too much salt increases the risk of health problems, including high blood pressure. Therefore, health authorities have recommended limitations of dietary sodium. Many canned products are available in low-salt and no-salt alternatives.

Rinsing thoroughly after opening may reduce the amount of salt in canned foods, since much of the salt content is thought to be in the liquid, rather than the food itself.

2.5.3 Botulism

Foodborne botulism results from contaminated foodstuffs in which *C. botulinum* spores have been allowed to germinate and produce botulism toxin, and this typically occurs in canned non-acidic food substances that have not received a strong enough thermal heat treatment. *C. botulinum* prefers low oxygen environments and is a poor competitor to other bacteria, but its spores are resistant to thermal treatments. When a canned food is sterilized insufficiently, most other bacteria besides the *C. botulinum* spores are killed, and the spores can germinate and produce botulism toxin. Botulism is a rare but serious paralytic illness, leading to paralysis that typically starts with the muscles of the face and then spreads towards the limbs. The botulinum toxin is extremely dangerous because it cannot be detected by sight or smell, and ingestion of even a small amount of the toxin can be deadly. In severe forms, it leads to paralysis of the breathing muscles and causes respiratory failure. In view of this life-threatening complication, all suspected cases of botulism are treated as medical emergencies, and public health officials are usually involved to prevent further cases from the same source.

2.6 CHAPTER'S SUMMARY

To conclude this chapter, a review of the literature is essential to show all material studies and methods to improve knowledge of this project. Every thesis and other project related to this canning machine is very helpful especially for us to fully understand it.

After many materials and methods are discussed and research is done, the most suitable material for our project is stainless steel. Due to its nature and advantages, while the method we decided on was the method of laying hands. This is because of the low cost benefits and great for the beginner process.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is an attack plan, especially when an attack plan is used repeatedly. This may be obvious, but word methodology is related to word methods. In fact, methodology is a system of methods that is consistently followed. Scientists, for example, use a variety of methodologies as they experiment. It seems that this world is just chaos and chaos. Therefore, the purpose of conducting research is to obtain answers through the use of systematic and scientific methods. Therefore, every study needs a methodology as a way to obtain findings. The methodology used requires systematic techniques to meet scientific needs, scientific methods and quality. To develop this system, several methods for displaying materials have been developed such as obtaining hardware and information through instructors and other colleagues.

In addition, it is very important to know and understand in depth each process found in the structure of the study methodology. One of the things to do is get as much information as possible. Canning machines are made to extend the life of a food and improve the quality of products of small and medium entrepreneurs in terms of hygiene.

In this chapter, there will be a lot of information about our final project manufacturing process and journey. There will be a flow chart showing the process we make the whole project. This flow chart will describe the process we went through. Next, is the Gantt Chart, which will show the actual and planned for the last 13 weeks of our last year project trip.

3.2 FLOW CHART

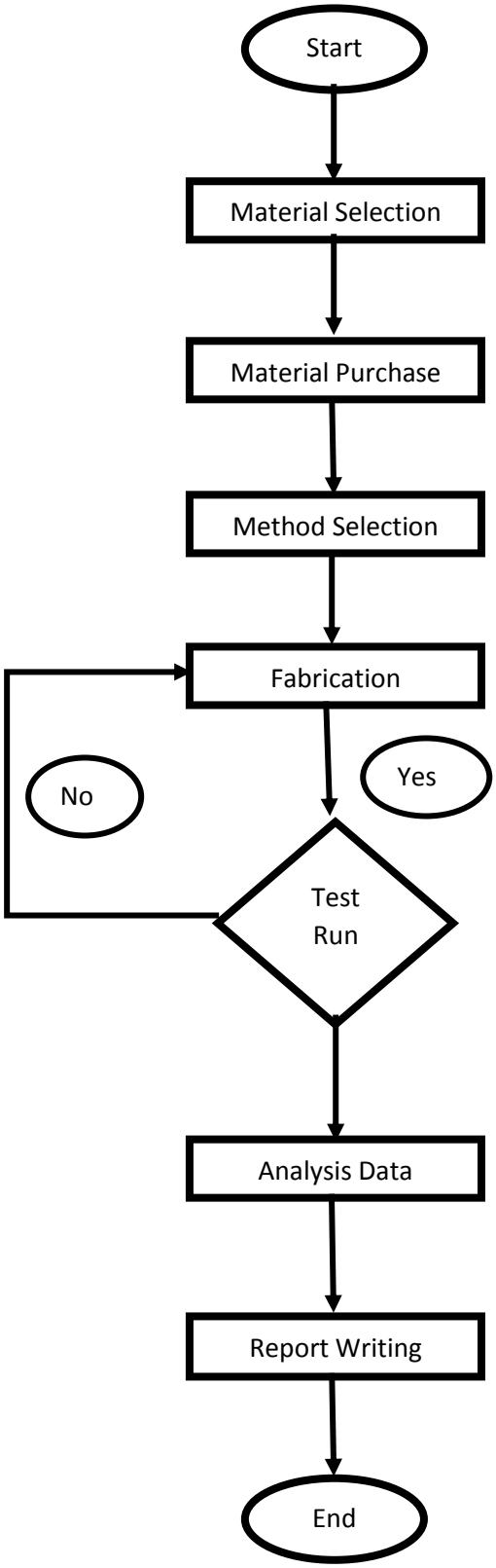


Figure 3.2.1 – Flow Chart

3.3 FLOW CHART EXPLAINATION

- **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) Thread rod

Figure 3.3.1- Thread rod

A threaded rod, also known as a stud, is a relatively long rod that is threaded on both ends; the thread may extend along the complete length of the rod.They are designed to be used in tension. Threaded rod in bar stock form is often called all-thread.

2) Steel C channel

1) Figure 3.3.2 – Steel C channel

The structural channel, also known as a C-channel or Parallel Flange Channel (PFC), is a type of (usually structural steel) beam, used primarily in building construction and civil engineering. Its cross section consists of a wide "web", usually but not always oriented vertically, and two "flanges" at the top and bottom of the web, only sticking out on one side of the web. It is distinguished from I-beam or H-beam or W-beam type steel cross sections in that those have flanges on both sides of the web. he structural channel is not used as much in construction as symmetrical beams, in part because its bending axis is not centered on the width of the flanges. If a load is applied equally across its top, the beam will tend to twist away from the web. This may not be a weak point or problem for a particular design, but is a factor to be considered.Channels or C-beams are often used where the flat, back side of the web can be mounted to another flat surface for maximum contact area. They are also sometimes welded together back-to-back to form a non-standard I-beam.

3) Nut

Figure 3.3.3 – Nut

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together. The most common shape today is hexagonal, for similar reasons as the bolt head: six sides give a good granularity of angles for a tool to approach from (good in tight spots), but more (and smaller) corners would be vulnerable to being rounded off. It takes only one sixth of a rotation

> to obtain the next side of the hexagon and grip is optimal. However, polygons with more than six sides do not give the requisite grip and polygons with fewer than six sides take more time to be given a complete rotation. Other specialized shapes exist for certain needs, such as wingnuts for finger adjustment and captive nuts (e.g. cage nuts) for inaccessible areas.

4) Diamond texture plate metal

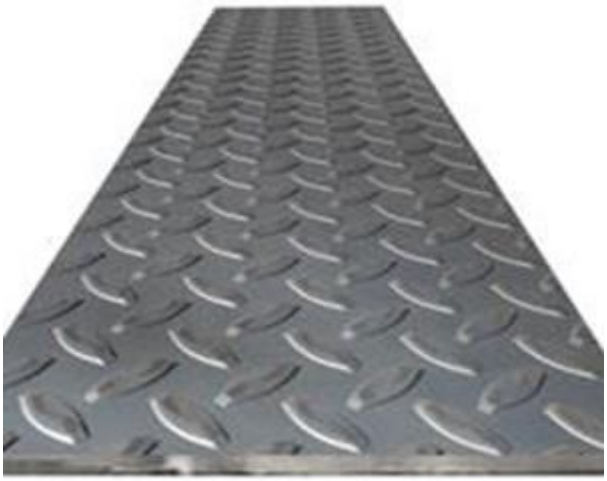


Figure 3.3.4 – Diamond texture plate metal

Diamond plate, also known as checker plate and tread plate, is a type of metal stock with a regular pattern of raised diamonds or lines on one side, with the reverse side being featureless. Diamond plate is usually steel, stainless steel or aluminum. Steel types are normally made by hot rolling, although modern manufacturers also make a raised and pressed diamond design. "Diamond plate" can also refer to similar anti-slip texture.

5) Thread coupling

Figure 3.3.5 –Thread coupling

A coupling (or coupler) (used in piping or plumbing) is a very short length of pipe or tube, with a socket at one or both ends that allows two pipes or tubes to be joined, welded (steel), brazed or soldered (copper, brass etc.) together. f the two ends of a coupling are of different standards or joining methods, the coupling is called an adapter. Examples of adapters include one end BSP threaded with the other NPT threaded, and one end threaded with the other a plain socket for brazing.

6) Bearing

Figure 3.3.6 – Bearing

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

7) Chuck

Figure 3.3.7 - Chuck

A chuck is a specialized type of clamp used to hold an object with radial symmetry. Chucks on some lathes have jaws that move independently, allowing them to hold irregularly shaped objects. A few chuck designs are even more complex, involving specially shaped jaws, higher numbers of jaws, quick-release mechanisms, or other special features.

8) Seaming roller

Figure 3.3.8 – seaming roller

A can seamer is a machine used to seal the lid to the can body. The lid or "end" is usually tinplated steel (food) or aluminum (drinks) while the body can be of metal (such as cans for beverages and soups), paperboard (whisky cans) or plastic.The seam formed is generally leak proof, but this depends on the product being canned. The seam is made by mechanically overlapping the two layers to form a hook.Different parameters of the hook are measured and monitored to check the integrity of the seam under different conditions.

9) Steel rod

Figure 3.3.9 – steel rod

ar stock, also (colloquially) known as blank, slug or billet,[1] is a common form of raw purified metal, used by industry to manufacture metal parts and products. Bar stock is available in a variety of extrusion shapes and lengths. The most common shapes are round (circular cross-section), rectangular, square and hexagonal or hex. A bar is characterised by an "enclosed invariant

convex cross-section", meaning that pipes, angle stock and objects with varying diameter are not considered bar stock.

- 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.

- Method Selection

This method selection process is important so that the method choose is accurate and suitable for the product. This method selection will avoid money-lost and time taking processes. Hence, it is important to carry out this method selection process. There are three methods that could be carried out:

1) Robot welding

Figure 3.3.10 – Robot welding

welding techniques using robots are faster than humans. Processes such as gas metal arc welding, while often automated, are not necessarily equivalent to robot welding since a human operator sometimes prepares the materials to be welded. Robot welding is commonly used for resistance spot welding and arc welding in high production applications, such as the automotive industry.

1) Manual welding

Figure 3.3.11 – Manual welding

MIG welding can be used on aluminum, stainless steel and steel, and on every thickness from 26-gauge sheet metal to heavy-duty structural plates. MIG welding holds this big advantage over TIG because the wire feed acts not only as an electrode, but also as filler.

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

- Does the method work

A lot of discussions, researches and experiments were carried out to find the most suitable method to carry out this home canning machine. Hence, it is decided to use manual welding. This is because, manual welding method requires less cost and less equipment. we have done some cutting work and using the services of a welding specialist

- Fabrication

  Cutting

i. measure is an important process to determine the shape and size.
ii. Cutting all parts.

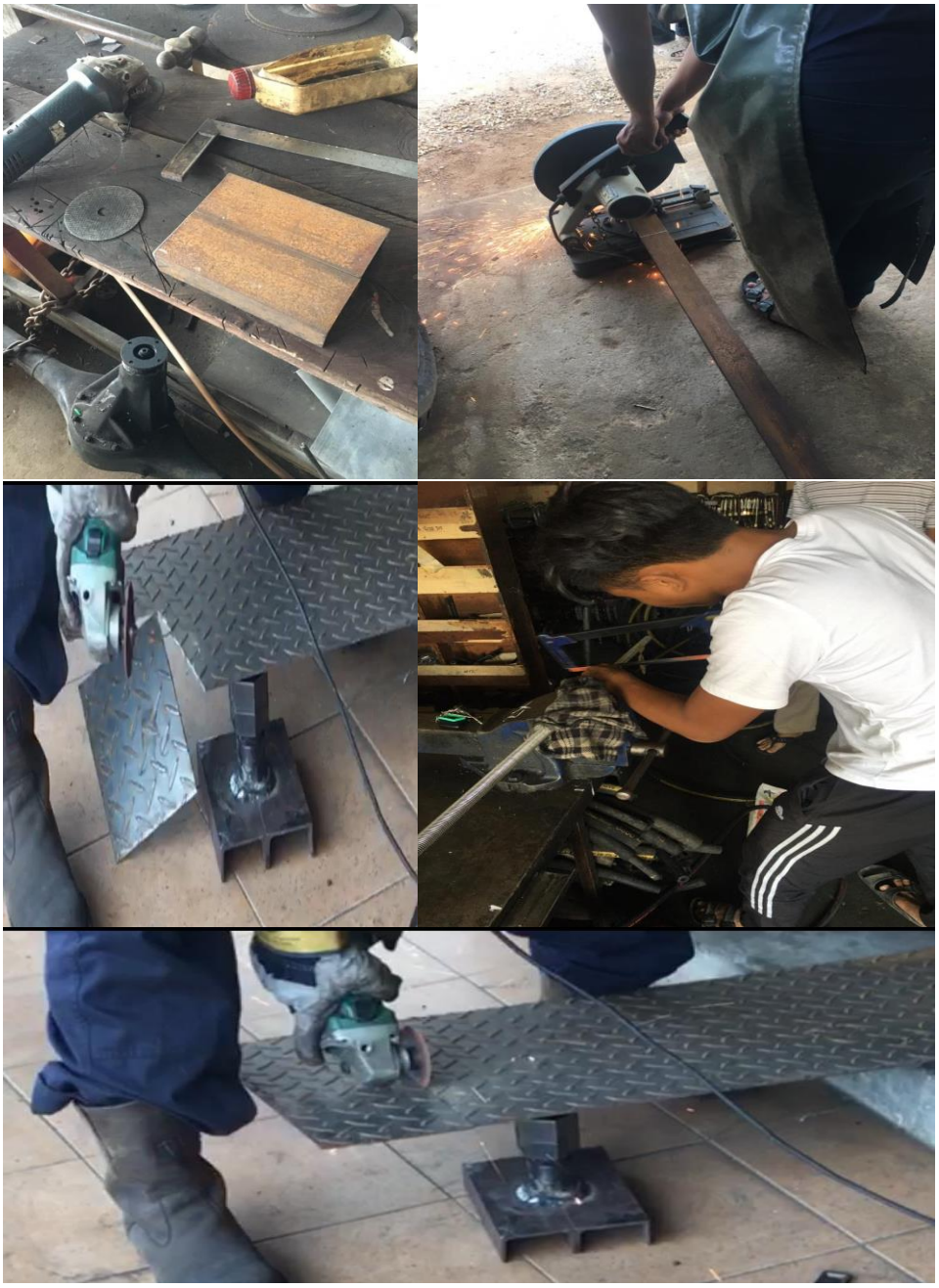


Figure 3.3.12 – cutting

Welding

i. Double-sided metal type c channel and weld on the edges to make a base of project.
ii. Put the thread coupling on the center of the base and weld.
iii. Place thread rod at each corner and weld it.
iv. Make holes in each corner of Diamond texture plate metal
v. turn 2 nut into the thread coupling and weld it so as not to move.
vi. Put bearing on the top of nut and weld it.
vii. Place chuck into hold of bearing and weld it
viii. Make a hole in the middle of Diamond texture plate metal so as to be able to insert a chuck into it.

ix. Make an oval hole in the side so as to be able to insert a seaming roller.

x. Bent a steel rod to make a lever.

xi. Combine lever with chuck at Diamond texture plate metal.

xii. Put the top part into each thread rod and lock using nut.

Figure 3.3.13 – welding

- Test Run

Test run is carried out to determine the strength and end result of the product . In this test run. We use unsealed cans and pour water into it. Close the cans using the lid neatly. Place the can on chuck and lock using nut at top and chuck.Give some pressure at seaming roller while the lever is rotated clockwise. remove the can from chuck and turn the can. We found the water did not come out.

Figure 3.3.14 – test run

- Analysis Data

The process of evaluating data using analytical and logical reasoning to examine each component of data provided. This form of analysis is just one of the many steps tha t must be completed when conducting a research experiment. Data from the test run is gathered, reviewed and the analysed to form findings, discussions and conclusion. In this project the data collection is collected from the tensile strength of the material we created.

- Report Writing

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

3.4 PRODUCT DESIGN

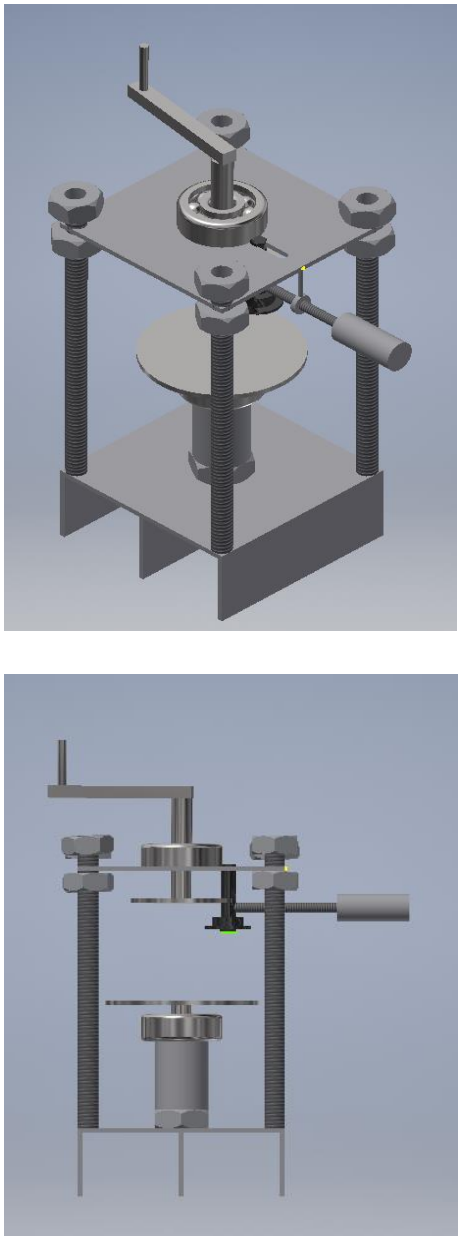
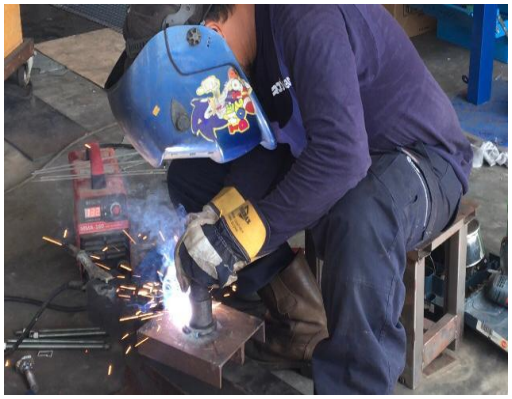


Figure 3.4.1 – Design

3.5 OPERATIONAL METHODOLOGY

CUTTING



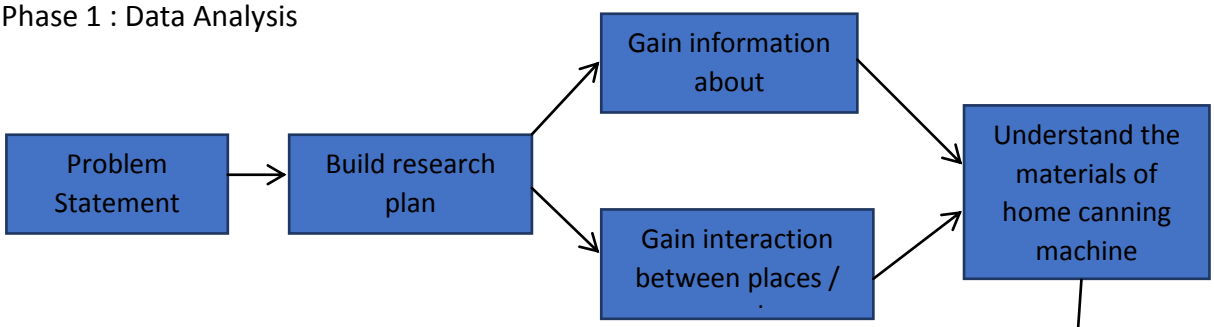
WELDING

- **CUTTING**
  Cutting proses is carried out by preparing a parts. Take appropriate measures to be stable on the floor. cut out the required parts and prioritize safety by wearing glove,safety boot and safety glasses to avoid accidents.

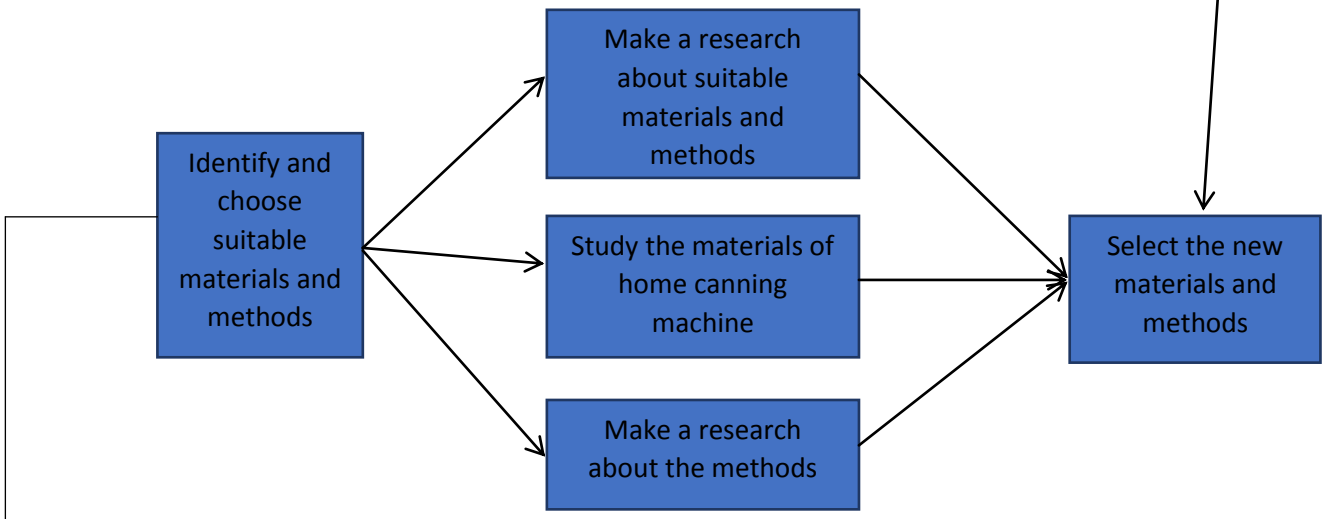
- **WELDING**
  Welding proses started by arrange the parts in place. make sure it is arranged precisely to avoid an error.Do one spark splash for safe measures. When all the parts have been welded join all the parts into a project.

3.6 METHODOLOGY PHASE

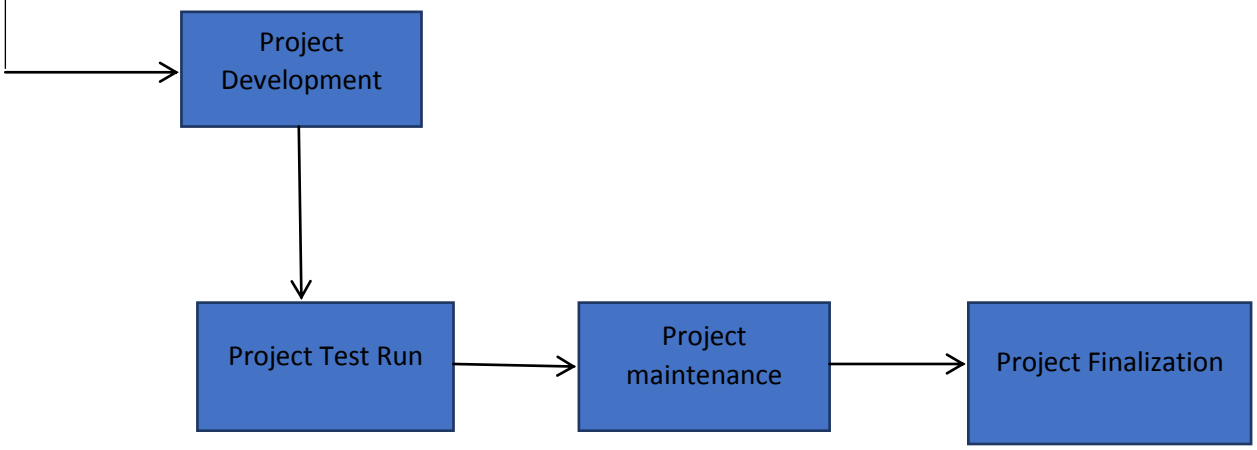
Phase 1 : Data Analysis



Phase 2 : Method and Material



Phase 3 : Preliminary Study



3.7 BUDGET CALCULATION

No.	MATERIAL / EQUIPMENT	AMOUNT/(UNITS)	PRICE/(RM)
1	Thread rod	4	28
2	Steel C channel	1	30
3	Nut	10	44
4	Diamond texture plate metal	1	13
5	Thread coupling	1	25
6	Bearing	2	20
7	Chuck	2	18
8	Seaming roller	1	12
9	Steel rod	1	10
10	Washer	8	4

Table 3.7.1

3.8 PROJECT ACTIVITY

project Activ	weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing and Project Planning														
Project Design														
Material Selection														
Materials Purchase														
Method Selection														
Fabrication														
Test Run														
Analysis Data														
Report Writing														
Video and Slide making														
PITEX preparations														
PITEX presentation														

Table 3.8.1

Planning

Actual

3.9 SUMMARY

As a conclusion, the methods implemented in this project are very crucial and important to complete the project. The materials used in the project will create a strong and stable yet very cheap, hence this project is very convenient to the small and medium industries and also the environment because not use electricity. However, this method will affect the result totally if one of the method is change.

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 INTRODUCTION

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

4.2 SAFETY IN TESTING / PRECAUTIONS

In conducting testing work, safety questions are very important at the point of before, during or after testing. This is to prevent damage to components and test equipment. To prevent such incidents, the following is a list of safety measures that must be practiced.

- Ensure the test equipment is in good condition before testing .
- Wear suitable clean protective clothing, head covering, face mask, gloves and footwear.
- Always clean your hands before beginning work, before handling food and after any activity which may contaminate the food and equipment you are working with.
- Make sure all the testing methods follow the correct steps .
- Check for 'expiry date'/ 'best before'/ 'use by date, packaging integrity and storage conditions for packaged raw materials.
- Check all raw materials for visible deterioration, off-odour and for any foreign matter while receiving and storing.

4.3 ADVANTAGE AND DISADVANTAGE

Every project has its own pros and cons, the pros will help the people and also the environment. However, the cons or the disadvantages must be improved or change for the future so that we could enhance the good and very efficient product that hardly to find disadvantage of the project . Besides of the advantages, this project also disadvantages that we must overcome it in the future for the better good.

Advantage canning food chemically by changing the moisture, pH, or salinity levels to protect against microbes, bacteria, mold, and yeast. It also limits food enzyme activity. Combining these chemical processes with the physical barriers of can seals, and lids effectively prevents decay.

Disadvantage Time consuming process. Initial start up cost of buying the equipments. Person should know which foods are high risk and which are low. Change in ingredient may require a change in processing.Canning machines are expensive.Growing your own vegetables or fruits to save extra for the purpose of canning may take time.

4.4 COMPONENT TESTING (Canning Machine)

Testing on the project needs to be done to find out the results and problems encountered on the project. In addition, problems that will arise from testing can be detected before a product is marketed. Project testing is done together with group members as the first user

No	Name of component result	Result	Action
1	Pole and nut	Loose	replace with new nut
2	Handle rotation	Hard to rotate	Put grease on the bearing

4.4.1 SECOND STAGE OF MECHANICAL TESTING

Testing the second test performed is based on a checklist of mechanical components that have been printed to make it easier us to identify problems or results to be obtained **.**

No	Name of component	Result
1	Pole and nut	The nut in with well
2	Handle rotation	Smoth rotation

4.5 CHAPTER SUMMARY

As a conclusion for this chapter , the analysis and findings have been made. The are a lot of disadvantage of home canning machine , the challenger taken as a room for improvements and more developments for future generation and well as to enhance their knowledge on the project we carried out. Tes run is carried out to determine the problem of this machine .

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

This chapter describes the discussions, conclusions and joint improvement plans for this project. From the project test result data, analysis was performed. Therefore, a discussion of all the test and analysis results will be explained in this chapter. Then, conclusions will be drawn based on the discussion plans and improvements that have been made.

5.2 DISCUSSION

From the experiments, we need to determine the effect of heating time on the texture and sensory attributes of canned oden pasta. The heating time towards canned oden pasta is 10 min, 20 min and 30 min usually in food pasta there are many organisms that can cause food and bacterial damage that is always present in the air and water. In addition, the action of enzymes can also cause changes in the taste, color, and unwanted texture found naturally in food flavors. Therefore, we use the canning process to destroy the organism that causes the damage and also to kill the enzyme. In addition, oden pasta has a high acid content, it can be safely processed in boiling water cans or in pressure cans.

Through these experiments, the color, taste, texture and overall acceptance of canned oden pasta production results were assessed where the color of canned oden pasta is fixed to dark red for every 10 minutes, 20 minutes and 30 minutes. This may be due to a process that only takes 1 day to bear. Color change also does not occur where citric acid powder is added to prevent discoloration. On the other hand, other sensory attributes such as the taste show vary as a result where the taste is sour, equally sour and very sour at 10 minutes, 20 minutes and 30 minutes respectively. This may be due to the longer heating time which contributes to a higher concentration of salt in canned oden pasta for 30 minutes.

The heating process can change the taste and texture of the food. The degree of change is related to how sensitive food is to heat treatment. However, high temperatures and short-term exposure to heat are less damaging to taste and texture than high or low temperatures and old processes. Also, the overall reception of canned food pasta in 10 minutes, 20 minutes, and the result of 30 minutes is delicious and can be eaten all the time. This may be due to a shorter period of time which indicates less impact on the overall acceptance assessment.

Through these experiments, there are several sources of errors that we make that can affect the accuracy of the results. For example, the time to process the cans is not 10,20 and 30 minutes perfectly because we have thrown it away before the time. Also, some other canned oden pasta is too long in boiling water than it should be. To reduce this error, various precautions should be taken, caution while conducting these experiments must be used to avoid quality factors such as texture and color not being destroyed.

5.2 CONCLUSION

Through this project, it helps to develop creativity in creating projects and modifying existing projects to be more flexible working with new fabrication methods. Canning machine products have been successfully tested for saving energy products using potential energy. The effectiveness of the project used during the canning process shows that the machine can be adjusted to the desired height, tailoring roller adjustment and various types of cans can be used this shows that the project has the potential to be expanded to external agencies to expand it using. Promotion must be for commercial purposes.

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APPENDIX

POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

Survey Forms

Canning Machine

SECTION A : RESPONDENT DEMOGRAPHY

1. Gender :

( ) Male ( ) Female

2. Age :

( ) 15-25 ages

( ) 26-30 ages

( ) 31-40 ages

( ) 41 and above

3. Occupational :

( ) Students

( ) Employee

( ) Others

SECTION B : GENERAL VIEW OF THE STUDY

Please tick (√) your choice in the appropriate box based on the following scale.

Level of Approval	Scale
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

1. Do you have a knowledges about canning machine?

   ( ) Yes ( ) No

2. Are the price of canning machine were affordable for people to buy it?

   ( ) Yes ( ) No

No	Statement	1	2	3	4	5
3.	Seaming roller is one of the parts of a machine ?					
4.	Can canning machine increased an income for people who want to start a small buniness?					
5.	Do you agree with our prototype machine can prolonged the shelf life of the food ?					