POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DRY FREEZE MACHINE

SUEMELLLIESSA SEE KHUN KEOW	**08DMP18F1017**
MUHAMMAD SYAFEQ AIMAN BIN AZMI	**08DMP18F1018**
CHIA VINNA	**08DMP18F1032**

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DRY FREEZE MACHINE

NAMA	NO.PENDAFTARAN
SUEMELLLIESSA SEE KHUN KEOW	08DMP18F1017
MUHAMMAD SYAFEQ AIMAN BIN AZMI	08DMP18F1018
CHIA VINNA	08DMP18F1032

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DRY FREEZE MACHINE

NAMA	NO. PENDAFTARAN
SUEMELLLIESSA SEE KHUN KEOW	08DMP18F1017
MUHAMMAD SYAFEQ AIMAN BIN AZMI	08DMP18F1018
CHIA VINNA	08DMP18F1032

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 : DRY FREEZE MACHINE
SESI : JUN 2020

1. Kami, **1. SUEMELLLIESSA SEE KHUN KEOW (08DMP18F1017)**
2. MUHAMMAD SYAFEQ AIMAN BIN AZMI (08DMP18F1018)
3. CHIA VINNA (08DMP18F1032)

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.

3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk peanugerahan **Diploma Kejuruteraan Mekanikal (Pembungkusan)** kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui

Oleh yang tersebut;

a) SUEMELLLIESSA SEE KHUN KEOW	)	…….
(No. Kad Pengenalan: 001007-02-0472)	)	SUEMELLLIESSA
b) MUHAMMAD SYAFEQ AIMAN BIN AZMI	)	…….
(No. Kad Pengenalan: 000909-03-0173)	)	MUHAMMAD SYAFEQ
c) CHIA VINNA	)	…….
(No. Kad Pengenalan: 000705-01-0218)	)	CHIA VINNA
Di hadapan saya, AHMAD FAKARUDDIN BIN MOHD FAUZI(821127-08-6189)	)	…….
sebagai penyelia projek pada tarikh: 18/12/2019	)	AHMAD FAKARUDDIN

ACKNOWLEDGEMENT

First of all, thanks to God's help for giving us the blessing to complete our final year project. I would like to thanks our lecturer and as our supervisor En.Ahmad Fakaruddin Bin Mohd Fauzi, who giving us priceless advices and guidance through the final year project from semester 4 until semester 5. Moreover, I would also like to thank the other lecturers who taught and led us at Polytechnic.

After that, we would like to thanks our group members for giving full cooperation, commitment and support for our final year project successfully. We can't finish this project without a cooperation of teammates.

Lastly, we could like thanks our parents giving us support from home, friends and classmate that help us in the process of completing ours project.

Abstract

In this era of globalization, food waste issues have become increasingly serious.Humans have wasted an estimated 1.3 billion tons of food each year. This is because nowadays, many consumers are busy with daily tasks and do not have the free time to manage food items after a tiring day of work. Food becomes spoiled due to the action of bacteria & fungi. Freezing dry food can extend the shelf life of food and avoid more wasted food. The ‘dry freeze machine’ prototype is very important to make it easier for consumers to dry food. In addition, the prototype ‘dry freeze machine’ can extend the shelf life of consumer food. The objective of this study is to design and develop a prototype ‘dry freeze machine’ for use in the field of nutrition, prevent food waste and prolong the shelf life of food and produce quality food. Research methodology is the triggering of ideas, scientific research, generation and selection of design concepts, detailed design, prototype development, selection and preparation of materials, availability and cost, parameters, installation and finishing, engineering analysis and completion studies, provide references to the design, specifications and technology used in the production of "Dry Freeze Machine" that has been on the market. The existing product on the market, ‘DRY FREEZE MACHINE’ is used in large industries only. Therefore, we want to create a ‘Dry freeze machine’ that is small in size, simple and easy to operate.

ABSTRAK

Pada era globalisasi ini, isu-isu pembaziran makanan telah semakin serius. Manusia telah membazirkan dengan anggaran 1.3 bilion tan makanan setiap tahun. Hal ini kerana pada masa kini, ramai pengguna yang sibuk dengan tugas harian dan tidak mempunyai masa terluang untuk menguruskan bahan makanan setelah penat bertugas seharian. Makanan menjadi rosak akibat tindakbalas bakteria dan kulat. Membeku kering makanan dapat memanjangkan jangka hayatnya dan menggelakkan lebih banyak makanan yang dibazirkan. Prototaip 'Dry Freeze Machine' amat penting untuk memudahkan pengguna mengeringkan makanan. Di samping itu, prototaip 'Dry Freeze Machine' dapat memanjangkan jangka hayat makanan. Oleh itu, objektif kajian yang ditetapkan ialah merekabentuk dan membangunkan prototaip 'Dry Freeze Machine' bagi kegunaan di bidang pemakanan, menggelakan pembuangan makanan dan memanjang jangka hayat makanan dan menghasilkan makanan yang berkualiti. Metodologi kajian ialah cetusan idea, kajian ilmiah, penjanaan dan pemilihan konsep rekabentuk, rekabentuk terperinci, pembangunan prototaip, pemilihan dan penyediaan bahan, kebolehdapatan dan kos, parameter, pemasangan dan kemasan dan analisis kejuruteraan. Setelah kajian literatur dijalankan, maklumat yang diperolehi memberikan rujukan tentang rekabentuk, spesifikasi dan teknologi yang digunakan dalam penghasilan 'Dry Freeze Machine' yang telah berada di pasaran. Produk sedia ada di pasaran iaitu 'Dry Freeze Machine' digunakan di industri besar sahaja. Oleh itu, kami ingin mencipta sebuah 'Dry Freeze Machine' yang bersaiz kecil, ringkas dan mudah untuk dikendalikan.

CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Prepared by CHIA VINNA

1.1 RESEARCH BACKGROUND

In this era of increasing technological advancement, technological advancement has made our current work easier, faster and more efficient. However, in this progress, there are still many food waste incidents around the world. Analysis based on research shows that most people in the world have the habit of wasting food.

In other word, most people are accustomed to storing leftover or uneaten excess food (eg. vegetables, fruits, etc.) in the refrigerator. This will cause the refrigerator space to be over-full, and there is no extra space. Furthermore, the low temperature of the refrigerator interferes with the growth of food-damaging microorganisms (such as bacteria, mold and yeast) but cannot be eliminated. Thus, the shelf life of refrigerated food can only be stored for a few days or one week. Never the less, if the food is stored frozen, the shelf life is significantly longer by several weeks or months.

Freeze drying, also known as lyophilisation or cryodesiccation, is a low temperature dehydration process that involves freezing the product, lowering pressure, then removing the ice by sublimation. This is in contrast to dehydration by most conventional methods that evaporate water using heat. More specifically, because of the low temperature used in processing, the quality of the rehydrated product is excellent, and the original shape of the product is maintained. In fact, freeze-drying is known to result in the highest quality of foods amongst all drying techniques because structural integrity is maintained along with preservation of flavors.

Next, applications of freeze drying include biological and biomedical, food and preservation. Freeze drying method are common use in food industry because freeze drying not only extends the shelf-life of the foods while maintains 97% of the nutritional value of the food. Example of Freeze-dried products are usually seasonal fruits and vegetables; because of their limited supply, coffee, and food for military rations, astronauts/astronauts and hikers.

In a word, this study revolves around designing and developing the prototype ‘DRY FREEZE MACHINE’. To design the mechanism that will be used to move the machine needs to be set. A series of tests will be done on the prototype to ensure that it meets the specifications that have been set and works well.

1.2 PROBLEM STATEMENT

The “Dry Freeze Machine” prototype is very important to make it easier for consumers to dry food and avoid food waste. This is because nowadays, many consumers are busy with daily tasks and do not have the free time to manage foodstuff after a tiring days of work lead to the deterioration of uneaten food. Furthermore, food waste or discarding also occurs in supermarkets or restaurants. To that end, the prototype “Dry Freeze Machine” can extend the shelf life of food, maintains the nutritional value, color and taste of food.

1.3 RESEARCH OBJECTIVES

The objective of this research are:

I. Design and develop a prototype ‘dry freeze machine’ for use in the food field.
II. Avoid food waste.
III. Extends food life and produces high quality food.

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

I. How to freeze drying foods product?
II. Why freeze drying can extend shelf life of foods?
III. Why freeze drying can maintain nutritional of the foods?
IV. How freeze drying work?
V. Why freeze drying is the most effective among all drying techniques?

1.5 SCOPE OF RESEARCH

I. Dedicated to foods such as fruits and vegetables.
II. Dedicated to everyone.

1.6 SIGNIFICANCE OF RESEARCH

The importance of research:

In order to find causes of the food waste and reduce food waste worldwide. Besides that, find out most effectively method to extend shelf life of food. In addition, although there are many kinds of freeze-drying machines in the market, however mostly the price is very expensive which is not everyone can afford it. For example, a small freeze-drying machine costs more than 3800 US dollars. Thus, the findings of the study will give benefits for the people who want to own a freeze dryer but cannot afford it. On the whole, dry freeze machine surely brings many advantages for consumers.

1.7 CHAPTER'S SUMMARY

In summary, after conducting a literature review, a lot of information can be gathered about the "Dry Freeze Machine". This information provides references to the design, specifications and technology used in the production of "Dry Freeze Machine" that is already on the market. Additionally, this information is also very useful as a guide to help facilitate the design and development of the "Dry Freeze Machine" prototype.

CHAPTER 2

LITERATURE REVIEW

Prepared by Suemellliessa

2.1 INTRODUCTION

In this chapter, freeze drying began as early as 1890 by Richard Altmann who devised a method to freeze dry tissues (either plant or animal), but went virtually unnoticed until the 1930s. In 1909, Shackell independently created the vacuum chamber by using an electrical pump. No further freeze drying information was documented until Tival in 1927 and Elser in 1934 had patented freeze drying systems with improvements to freezing and condenser steps.

A significant turning point for freeze drying occurred during World War II. Blood plasma and penicillin were needed to treat the wounded in the field, and because of the lack of refrigerated transport, many serum supplies spoiled before reaching their recipients. The freeze-drying process was developed as a commercial technique that enabled blood plasma and penicillin to be rendered chemically stable and viable without refrigeration. In the 1950s–1960s, freeze drying began to be viewed as a multi-purpose tool for both pharmaceuticals and food processing.

FIGURE 2.1

2.2.1 INTRODUCTION DRY DEHYDRATOR

So, why did people start drying out their food? It's really quite simple—fresh food was not always available. Don't forget, there was a time before grocery stores. Without dried foods, a nomadic lifestyle would have been impossible. The sun and wind (or the smoke from a fire) provided the means to remove water from grains, meat, fruits, and herbs. This allowed them to be preserved from one season to the next. The process saved lives by filling bellies during lean seasons or travel. However, it wasn't easy. Successfully drying food depended upon choosing the correct days to dry it, luck, and more than a little ingenuity. The elements were unpredictable and the environment untameable. For example, food that was left to dry in open fields could be gone in a flash. It could rain, insects could infest it, or wild animals and birds could enjoy the feast. Entire crops could be lost by accident and starvation would follow. It was a delicate and important process, one that proved to be crucial to the survival of countless cultures.

Over time, a variety of cultures from around the world perfected the technique of drying wild and cultivated foods. The Greeks and Romans dried peas and grapes successfully (you're welcome raisin lovers!). The Persians discovered ways to successfully preserve dates, apricots, and melons. The Chinese and Japanese proved to be especially clever at the art of food preservation, curing fish and sea vegetables with relative ease. Mongolian explorers, en route to Europe, packed bundles of dried milk products to sustain them throughout the epic journey. In Canada, early settlers learned how to dry food from the indigenous population. They observed the practice of sun-drying food by Native Americans in the northern regions. Soon they were able to dry wide varieties of corn, squash, and herbs (plus buffalo meat and venison, pioneered in the west).

Way back in the nineteenth century United States, many housewives began to expand the possibilities of food preservation. They started preserving fruits in sugar, vegetables and nuts in salt, and vegetables in brine. Dried food was a traditional alternative to fresh food, but before the age of glass canning jars and self-sealing zinc jar lids (which were not patented until 1858), food was most likely to be stored in stone or earthenware crocks, tin cans, and glass containers. Sealing wax, beeswax, corks, and even putty were sometimes used to seal the lids. So stored food didn't exactly look as appealing or professional as what we're used to today. It looked more like an arts and crafts project than commercial food.

Throughout history, dried meats and fish have provided life-sustaining protein for people around the world. Our ancestors dried meats and kept them for years without refrigeration (expiry dates weren't exactly common at the time). In fact, meats and fish were the most commonly dried foods throughout history since they were much harder to come by. It's ironic to consider this now, given that fish is one of the most difficult types of food to dry due to the vast potential for bacterial growth in the raw product. Historically, meat (like fish) was pre-treated in a dry salt cure or a brine solution. The salt served to draw water out of the food and turned it into a primitive form of the

jerky you might buy in a gas station. Meats and fish were also smoked for preservation, but obviously this process didn't allow the food to last as long as dehydration.

Many foods that we take for granted today would not be part of the world's cuisines were it not for vital pioneers discovering how to dry and preserve them for extended periods of time. How different would Chinese, Japanese, Thai, and other Asian cuisines be without dried fish, shellfish, or sea vegetables like seaweed? It's almost impossible to imagine what those menus would look like without dehydration.

After centuries of experimentation, several Asian cultures discovered that many foods had intriguing flavors and textures when dried. This created new recipes and flavour profiles that never would have existed otherwise. For instance, the Chinese enjoy fresh sea scallops in cooking, but even that delicacy cannot be compared to the exquisite taste of a dried scallop. Flowers like lily buds are also eaten fresh throughout Asia, but are more commonly consumed dried. The same can be said for fungi, such as tree ears. Some items, such as shark's fin and sea slug, are more prized (and more expensive) in dried form than fresh.

Additionally, the Chinese lay claim to being the first to cure pork products like ham, bacon, and sausage. They called it ham huo-fu or fire-dried meat. More specifically, the word refers to any meat that is cured by having first been soaked in a soy sauce marinade, then dried over a slow fire. Many Chinese chefs also treat bacon in the same way. To this day, strips of cured pork belly, dark golden in color, hang in Chinese meat markets. The flavour is extraordinary, a true delicacy that would never be possible without the innovation of food dehydration.

As you can see, the history of food dehydration is vast and spans many cultures. These days, there are so many different forms of food preservation available that dehydration can often seem like a an odd and niche practice. However, anyone who denies themselves the joy of dehydrated food isn't just missing out on delicious food, they are also ignoring an important development in the history of humanity. So, don't shy away from food dehydration. It is after all one of the most important methods of food preservation and preparation ever conceived by humans.

METHOD THAT USED SUN TO DEHYDRATED THE FOOD.

Figure 2.2

METHOD THAT USED OVEN TO DEHYDRATED THE FOOD.

Figure 2.3

2.2.2 ADVANTAGES

Advantages of Dehydrating Food

Dehydration has long been known to be the best way for food preservation. With this means, you are sure to have a well-preserved food. It is also known to be used in ancient times. Solar dehydration was mostly preferred. In early times, drying food which in today's time termed as dehydration was the only and best way to increase the duration your food will last.

In our current era, there is equipment that is very helpful in food dehydration. A food dehydrator is now used to preserve food. Nowadays, technology is growing rapidly, and as such, the way people live is also changing.

It is undoubtedly true that dehydrating food is imperative. There are so many remarkable reasons as to why you should consider this technique. Most people are not aware that this technique is very vital to preserve your food.

Retains Nutrients

When you dehydrate food more so using a food dehydrator, the original nutrients are still preserved. These nutrients, like minerals, vitamins and also enzymes, are not lost from the food. This is the best method which is far good as compared to when cooking or even food preservation.

When food is cooked, almost all nutrients are removed from the food. But with dehydration, nutrients will be preserved properly. These nutrients are very good for your body and will make you healthy.

There are no added chemicals in dehydrated food.

Dehydrated food has only one ingredient which the food itself. If any of the chemicals or preservatives are found in the food, after dehydrating it, they are all removed. Thus, with this technique, you do not need to worry about consuming harmful chemicals or whatsoever.

Storage and preservation is easy

Another pro of this method is easy storage and also preservation. The main aim of dehydrating food is to preserve it to be used for a long time. When all of the moisture is removed from the food, bacteria that may be formed are prevented. With this, bacteria won't be able to get in the food.

Control the Ingredients

Homemade foods and snacks are very good as compared to those packed or restaurant foods. This is because you can control what ingredients to use while cooking them. As such, you will be in a better position to only add those ingredients you will want to eat.

You can dehydrate your homemade foods on your own, which are healthy and nutritious. With a dehydrator, you can make homemade items like herbal teas, dog treats or even dried herbs. Therefore, besides saving you money and enhancing your health, dehydrating is ideal for enhancing your home life aspects.

2.2.3 DISADVANTAGES

Disadvantages of Dehydrating Food

It Takes Time

For you to achieve great results when dehydrating food, you should be patient. This process takes some time for the food to be completely dry. This may not be in-line with your schedule hence causing inconveniences to you.

The Taste and Appearance of Food May Change

If you always take fresh food, the dried food might taste-off at the beginning. You should know that the food you dried in your home is different from the one at the store.

The appearance of food is the main thing that brings appetite. If the food appears not to be good, then you won't have an appetite anymore. For instance, the appearance of a fresh apple is always delicious than the dried ones. This may, in turn, affect your appetite.

Food that has been dehydrated does not have water. As such, if you are taking part in those activities that may make your body lose water, then you are at risk of having headaches. Even if you eat these dehydrated foods, they won't help. Due to this, this dehydrated food may not be good to consume while doing some activities.

Might Lead to Weight Gain

Dehydrated food appears to be small in size since water is drained from it. And it is also rich in calories. The moisture accumulated in the food is removed through dehydration. This will make it be smaller in size. One might, therefore, end up eating a lot of food rich in calories without realizing it. This will, in the long run, lead to weight gain.

Lower Nutrient Value

Since dehydrated food is prepared well and stored for a very long time, it can lose its nutrients, if not processed, stored and prepared correctly. This is because of excessive heat and also the storage conditions. You should thus, store food properly so as it does not get affected with heat.

Before drying food, ensure that you go through the manual and understand it. This will help you know the drying times for different types of food.

Excess calories

These calories are the main cause of weight gain. Store-bought dehydrated food has high calories, and if you eat a lot, it will lead to weight gain. The dried food is the best when doing hiking since you require more calories. But just eating while relaxing at home watching television, can make you gain so much weight hence leading to health issues. **Therefore, it is better to make you own so you know that there are NO ADDED CALORIES.**

2.3 METHODS

1. Raw or cooked foods are placed in the freeze dryer where they are frozen to between -30 degrees and -50 degrees Fahrenheit.

2. Once frozen, the freeze dryer creates a vacuum in the food chamber.

3. As the food is gradually warmed, the water turns to vapor and evaporates out of the food (sublimation).

4. When dry, the freeze dryer notifies the user that the process is complete by sounding an audible beep.

5. You can then remove the freeze dried food from the dryer and place it in vacuum-sealed containers that are moisture and oxygen proof (preferably a mylar pouch or a can) to ensure freshness until opened.

6. When water is added to the food, it regains its original fresh flavor, aroma, texture, and appearance.

2.4 MATERIAL SELECTION

FREEZE DRYING EQUIPMENT

The main components of freeze drying equipment are:

Refrigeration System

Vacuum System

Control System

Product Chamber or Manifold

Condenser

The refrigeration system cools the (ice) condenser located inside the freeze dryer. The refrigeration system can also be employed to cool shelves in the product chamber for the freezing of the product.

The vacuum system consists of a separate vacuum pump connected to an airtight condenser and attached product chamber.

Control systems vary in complexity and usually include temperature and pressure sensing ability. Advanced controllers will allow the programming of a complete “recipe” for freeze drying and will include options to monitor how the freeze drying process is progressing. Choosing a control system for the freeze dryer depends on the application and use (i.e. lab vs. production).

Product chambers are typically either a manifold with attached flasks, or, a larger chamber with a system of shelves on which to place the product.

The purpose of the condenser is to attract the vapors being sublimed off of the product. Because the condenser is maintained at a lower energy level relative to the product ice, the vapors condense and turn back into solid form (ice) in the condenser. The sublimated ice accumulates in the condenser and is manually removed at the end of the freeze drying cycle (defrost step). The condenser temperature required is dictated by the freezing point and collapse temperature of the product. The refrigeration system must be able to maintain the temperature of the condenser substantially below the temperature of the product.

2.5 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 bio-friendly dry freeze machine 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 is most compatible for our project. Due to its characters and advantages, meanwhile the methods that we decided to carry on is hands layup method. This is because of its low cost benefits and great for beginner's process.

Overview of equipment for freeze dryersIn this section, you will be guided through deciding how your freeze dryer should be configured, you will able to view our range of freeze dryers including possible options, accessories etc. as well as viewing pictures of the different parts to enable you to choose the optimal freeze dryer for your specific requirements.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is "'a contextual framework' for research, a coherent and logical scheme based on views, beliefs, and values, that guides the choices researchers [or other users] make".

It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge such that the methodologies employed from differing disciplines vary depending on their historical development. This creates a continuum of methodologies that stretch across competing understandings of how knowledge and reality are best understood. This situates methodologies within overarching philosophies and approaches.

Methodology may be visualized as a spectrum from a predominantly quantitative approach towards a predominantly qualitative approach. Although a methodology may conventionally sit specifically within one of these approaches, researchers may blend approaches in answering their research objectives and so have methodologies that are multimethod and/or interdisciplinary.

Overall, a methodology does not set out to provide solutions - it is therefore, not the same as a method. Instead, a methodology offers a theoretical perspective for understanding which method, set of methods, or best practices can be applied to the research question(s) at hand.

In this chapter, there will be a lot of information about the process and journey through out the making of our final project. There will be flow chart showing the process of us making the whole project. This flow chart will explain the processes we took. Next, is the Gantt Chart, which will show the actual and planning throughout all the 13 weeks of our final year project journey. However, in this chapter, we also will show 2 methods we researched to carry our final year project. Although, these 2 methods have its own pros and cons and it will be explained individually by the teammates.

Among those 2 methods are drying and freezing.. This method has a lot advantages and disadvantages

3.2 FLOW CHART

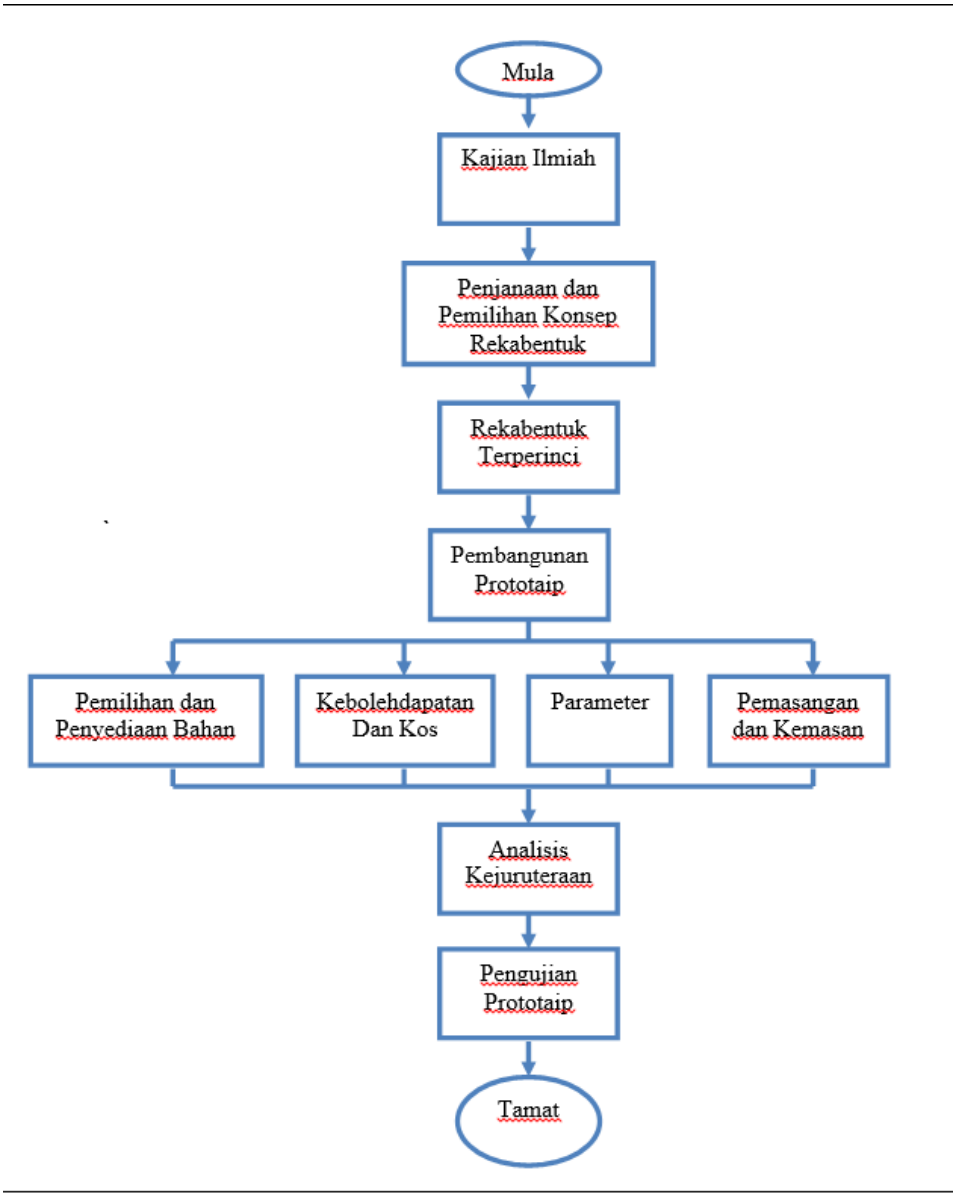


Figure 3.2.1 – Flow Chart

3.3 FLOW CHART EXPLAINATION

Prepared by Muhammad Syafeq Aiman Bin Azmi

- **Material Selection**

In a design process, the generation and selection of design concepts need to be done to acquire equipment, materials, and skills so that the project can be completed. Choosing the right and accurate material is very important to produce a prototype 'Dry Freeze Machine' that can function well as well as avoid time and cost loss.

I. Brass Ball Lever Valves

Figure 3.3.1- **Brass Ball Lever Valves**

-Features:

Is a valve with a flow controller shaped like a sphere. The ball disc has a hole right in the middle of the channel.

-How to use:

Ball valves open when the holes face toward both ends of the valve, and flow will occur. And when the handle is rotated so that the position of the hole is grooved to the end of the valve, then the position of the valve is closed (closed), and the flow will be obstructed or closed.

-Function:

Ball valves are widely used because of their ease of repair and their ability to withstand high pressures and temperatures. Connect the hose together with the addition of valves for flow control.The main function of the valve is to control the flow of liquid and gas through the system.-Unit used: 2 units.

II. Tee Three Way

Figure 3.3.2 –**Tee Three Way**

- Features:

Has 3 directional channels. Mostly used in water flow connections.

-How to use:

Mounted on a pipe or tube. Air or water will pass in 3 directions according to the way the machine is set.

-Function:

Used for connecting water or air in machines or tanks.

-Unit used: 2

III. Brass hose

Figure 3.3.3 – **Brass hose**

-Features:

Has a thread and has a pipe nozzle.

-How to use:

Brass Hose connects the direction of the hose to other parts of the hose, equipment, or other components. Systems are usually made with straight sections connected by fit or specially formed connections and connections.

-Function:

Hydraulic applications involve the transfer of liquids such as water and other chemical solvents. Hydraulic fittings must have fasteners that prevent liquid leakage and often must be stainless or other types of chemical corrosion.

-Unit used: 1 unit

IV. Hex pipe

Figure 3.3.4 - **Hex pipe**

-Features:

Has a ‘thread and nut’.

-How to use:

Installed in a stream of water or gas.

-Function:

Used in plumbing systems to connect straight pipes or tube sections, to adapt to different sizes or shapes, and for other purposes, such as controlling or measuring fluid flow. The term pipe is often used to describe high performance such as high pressure, high flow, high temperature, hazardous materials of liquid vehicles in specialized applications.

-Unit used: 2 units

V. Clear Braided PVC Hose Pipe Tube Reinforced

Figure 3.3.5 - **Clear Braided PVC Hose Pipe Tube Reinforced**

-Features:

The hose is a long, flexible pipe made of rubber or plastic.

-How to use:

Installed in a gas stove or water tank.

-Function:

To channel gas flow from one place to another.

-Unit used: 1 unit

VI. Tube Pipe

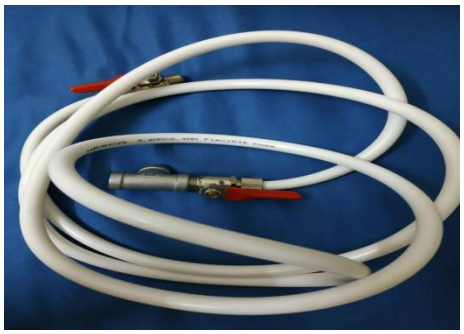


Figure 3.3.6 -**Tube Pipe**

-Features:

Flexible, long

-How to use:

Installed on the pipe.

-Function:

To channel water or gas to be transferred from one place to another.

-Unit used: 1 unit.

VII. Food containers

Figure 3.3.7 -Food containers

-Features:

Made of iron so it is hard.

-How to use:

Place the food to be ‘dry freeze’

-Function:

To put food.

-Unit used: 2 units.

VIII. Vacuum Pump

Figure 3.3.8 -**Vacuum Pump**

-Features:

It is a 2 stage' 'vacuum pump'.

-How to use:

Plug in the electrical switch and press the switch to turn on the 'vacuum pump'.

-Function:

To remove gas molecules from the sealed amount to leave half of the vacuum.

-Unit used: 1 unit.

IX. **Acrylic Plate**

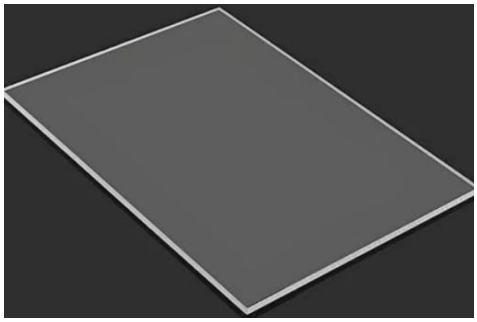


Figure 3.3.9-**Acrylic Plate**

-Features:

Transparent and thick

-How to use:

Closing the "chamber" in this project.

-Function:

So that no air comes in and out of the "chamber"

-Unit used: 2 units.

X. Pressure Gauge

Figure 3.3.10-**Pressure Gauge**

-Features:

Has 10 pressure bars.

-How to use:

Mounted on a pressure device

-Function:

To measure the pressure present on the installed tool.

-Unit used: 1 unit

XI. Neoprene Rubber Gasket

Figure 3.3.11-**Neoprene Rubber Gasket**

-Features:

Flexible and black in color.

-How to use:

Cut to the shape of the object you want to use.

-Function:

To close tightly so that no air or water enters or exits the sealed container using it.

-Unit used: 2 unit

XII .Large Glass Bowl

Figure 3.3.12-.Large Glass Bowl

-Features:

Thick, transparent and round.

-How to use:

Used as a ‘chamber’ in this project.

-Function:

To seal the air channelled by the "vacuum pump"

-Unit used: 1 unit

XII. **Polystyrene** [1.5meter]

Figure 3.3.13-**Polystyrene**[1.5meter]

-Features:

Disposable white board.

-How to use:

Cut to desired shape.

-Function:

To maintain the temperature of a cold item.

-Unit used: 4 units.

- **Material Purchase**

Choosing the right and accurate material is very important to produce a prototype 'Dry Freeze Machine' that can function well as well as avoid time and cost loss.

- **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 two methods that could be carried out:

  1) Drying

Figure 3.3.14-Drying method

Drying is a mass transfer **process** consisting of the removal of water or another solvent by evaporation from a solid, semi-solid or liquid. This **process** is often used as a final production step before selling or packaging products. Desiccation may be synonymous with **drying** or considered an extreme form of **drying**.

2) Freezing

Figure 3.3.15-Freezing method

Take a large piece of **dry ice** and keep it at the bottom of a clean bucket. **Use dry ice** in large pieces to ensure that the **ice** separates from the **frozen food** easily. Now, fill the bucket **with food** that needs to be **frozen**. Make sure that **food** is evenly spread out in the bucket.

- **Analysis Data**

  Analysis is done as a study that includes the use of information on human behaviour, limits and capabilities as well as other characteristics to design systems, machines, tools, tasks, environment and workspace to be productive, safe, comfortable and effective for human use. The products produced are comfortable and can meet the tastes, wants and needs of consumers in solving a problem.

- **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 Interview and research

We have conducted some interviews on google form because of covid-19 diseases and the result was positive.

Untitled form

	A	B	C	D	E	F	G	H	I
1	Timestamp	Setiap Keluar	Tahukah and	Makanan yar	Adakah Dry f	Makanan yar	Adakah kaed	Adakah jangl	Adaka
2	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
3	2020/11/09	tidak dapat d	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
4	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Ya
5	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
6	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
7	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
8	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
9	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Mungi
10	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
11	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
12	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Mungi
13	2020/11/09	simpan dalar	Tidak	Tidak setuju	Ya	Tidak	Ya	Ya	Mungi
14	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
15	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
16	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
17	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
18	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
19	2020/11/09	masak/maka	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
20	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Tidak	Mungi
21	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
22	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Ya
23	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Ya
24	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
25	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Mungi
26	2020/11/09	simpan dalar	Ya	Tidak setuju	Tidak	Tidak	Tidak	Tidak	Tidak
27	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
28	2020/11/09	campak kat :	Tidak	Tidak setuju	Tidak	Tidak	Tidak	Tidak	Mungi
29	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Ya
30	2020/11/09	balut surat k	Ya	Setuju	Ya	Ya	Ya	Ya	Mungi
31	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
32	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
33	2020/11/09	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Tidak	Mungi
34	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Mungi
35	2020/11/09	simpan dalar	Tidak	Setuju	Ya	Ya	Ya	Ya	Ya
36	2020/11/10	simpan dalar	Ya	Setuju	Ya	Ya	Ya	Ya	Ya
37	2020/11/10	tidak dapat d	Ya	Setuju	Ya	Ya	Tidak	Ya	Tidak
38									
39									
40									
41									
42									
43									
44									
45									

Figure 3.3.16-Consumers feedback

3.5 PRODUCT DESIGN

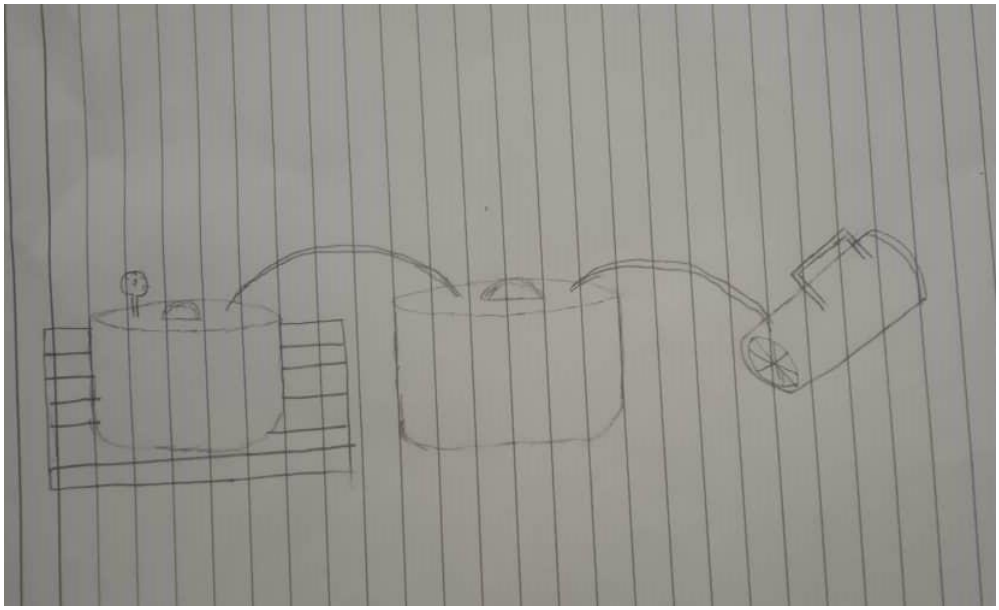
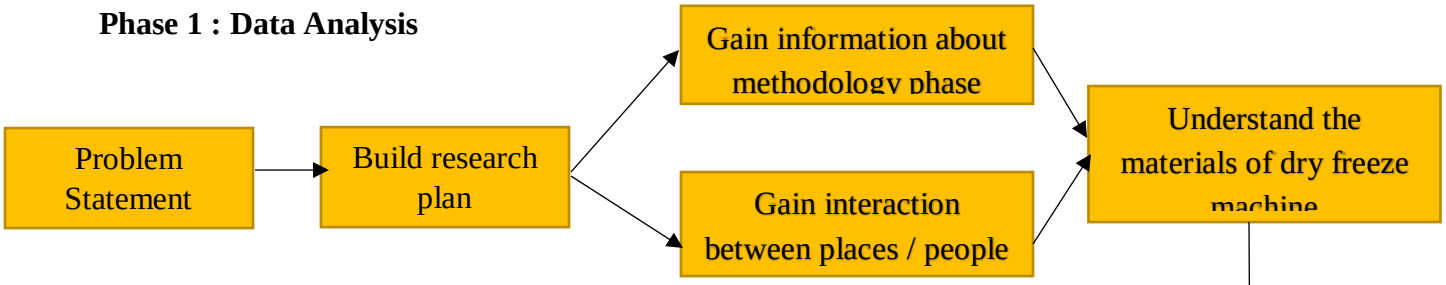


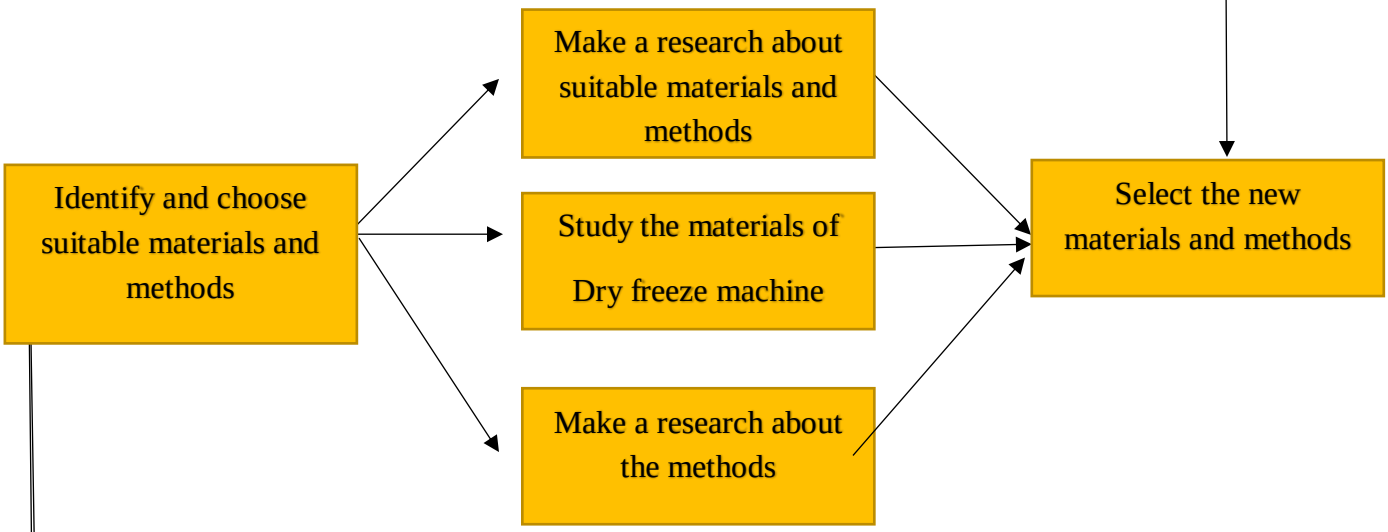
Figure 3.3.17-Product design

3.7 METHODOLOGY PHASE

Phase 1 : Data Analysis



Phase 2 : Method and Material



Phase 3 : Preliminary Study

3.7 BUDGET CALCULATION

Prepared by Muhammad Syafeq Aiman Bin Azmi

No	Materials / Equipment	Amount	Price
1.	**Brass Ball Lever Valves**	4 unit	RM56
2.	**Tee Three Way**	2 unit	RM16
3.	**Brass hose**	1 unit	RM10
4.	**Hex pipe**	2 unit	RM18
5.	**Clear Braided PVC Hose Pipe Tube Reinforced**	1 unit	RM13.11
6.	**Tube Pipe**	1 unit	RM9
7.	**Food containers (1 small, 1 big**	2 unit	RM82.80
8.	**Vacuum Pump**	1 unit	RM680
9.	**Acrylic Plate**	2 unit	RM75
10.	**Pressure Gauge**	2 unit	RM50
11.	**Neoprene Rubber Gasket**	2 unit	RM27
12.	**Large Glass Bowl**	1 unit	RM30
13.	**Polystyrene**[1.5meter]	3 unit	RM7.50
14.	**Screwdrivers (1 pair)**	1 unit	RM5.9
15.	**End cap**	1 unit	RM8
16.	**Dry ice**	5 pieces	RM35
		Total	RM1123.31

Table 3.3.1

3.8 PROJECT ACTIVITY

Research Activities	Dec 2019 ~ April 2020				
	Dec12	Jan12	Feb12	Mar12	April12
1. Scientific study					
2. Questionnaire development					
3. Sampling (field study)					
4. Data analysis and findings					
5. Report writing					
6. Review the report with the supervisor					

Table 3.3.2

3.9 SUMMARY

As a conclusion, the expected result is that consumers will be able to adapt to technological innovations in the field of food drying as well as provide good feedback on products related to price, brand, drying process and drying period.

CHAPTER 4

4.1 INTRODUCTION

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

4.2 ADVANTAGE AND DISADVANTAGE

Prepared By Muhammad Syafeq Aiman

This machine has many advantages of its own compared to drying in the sun but it also has its shortcomings. Therefore we need to identify the shortcomings and improve them so that users will be satisfied in the future.We will do our best to obtain the excess so that product shortages can be avoided

4.3 CHAPTER'S SUMMARY

As a conclusion for this chapter , analysis and data collection has been done.However our product is not 100% perfect it still has its own shortcomings.This challenges our patience and we need to think of ways to overcome the problem related to our product for better future use.

CHAPTER 5

DISCUSSION , CONCLUSION AND UPGRADE PLAN

Prepared by CHIA VINNA

5.1 INTRODUCTION

In this chapter, the decisions made are based on all the conclusions obtained from the experiments conducted above and the discussions in the previous chapters. Additionally， it also covers the objectives of the research and the recommendations of the research conducted. Then, this conclusion is based on the discussions and upgrade plans that have been conducted.

5.2 DISCUSSION

Based on the data we collected, we found out about the ‘single stage vacuum pump’poor performance because it residual gas partial pressure is 5x10-1~Pa, and the total pressure (the sum of residual gas and residual steam partial pressure) is 5pa. In fact, there is a "hazardous space" in the structure of the pump, and the gas in this space cannot be eliminated. When the rotary vane turns over the exhaust valve, this part of the gas is compressed and returns to the suction space through the gap between the rotor and the pump cavity, so there is always some gas that cannot be exhausted each time. The smaller the "harmful space", the higher the ultimate vacuum that the pump can reach. Second, When the pump oil circulates in the pump body, a large amount of gas and vapor will be dissolved. At a certain temperature, the gas capacity in the oil changes with the gas pressure. When the pump oil enters the suction space, the gas and vapor dissolved in the pump oil will be released again due to the decrease in the pressure of the outside air, filling the pump cavity, and reducing the ultimate vacuum of the pump. In view of the factors, all of us agree changed “Single Stage vacuum pump” to “Two Stage vacuum pump”. Because the blade slot on the rotor of the front pump of the “Two-Stage vacuum pump” adopts an oblique blade slot. The maximum enclosed working space formed by two adjacent blades, the rotor and the pump body is enlarged, which improves the vacuum pumping speed. Additionally, the back vacuum pump is connected in series after the back vacuum pump, and the harmful space gas in the back vacuum pump is quickly sucked in by the back vacuum pump to improve the ultimate vacuum of the pumping.

Afterwards， we choose “Acrylic Plate” as vacuum chamber top cover. In contrast, Acrylic is easy to fabricate and shape, because it is a thermoplastic and softens under high temperatures, acrylic can be formed into virtually any shape. Then, Acrylic plastic in place of glass is that while it’s more durable, it also weighs 50% less than glass. Acrylic plastic is highly transparent remains

transparent as it gets older without excessive yellow tinting, this is extremely important for applications that are exposed to sunlight. Besides that, it also easy to clean and maintain.

In conclusions, we need to change to a larger chamber because freeze-drying takes a long times (thirteen hour and above), size of our chamber is quite small. Therefore, change to a larger chamber so that more food can be freeze-dried at a time and save more time.

CONCLUSION

In summary, although our semi-automatic machines cannot be compared to the fully automated machines on the market, based on our project, consumers can purchase our high-efficiency freeze-drying machines at an affordable price. Consumers significantly can freeze-dry almost anything. For example, all kinds of fruits, vegetables and meats taste wonderful when freeze dried. That includes things like tomatoes, apples, bananas, strawberries, peaches, green beans, peppers, onions, potatoes, spinach, shrimp, pork, beef, turkey and even ice cream. Furthermore, your favorite meals that include meat may be easily freeze dried. Foods like lasagna, rice dishes, cheese macaroni, chili, beef stew, casseroles, shrimp, lobster, pasta sauces or scrambled eggs are perfect for this process, freeze-dried food can be easily rehydrated with water, especially hot water will restore it to its original state. In other word, you will find that it is a delight to experiment with different foods and meals in your freeze dryer. A great way to start is by picking meals that are already favorites in your home.

The expected result is that consumers will be able to adapt to technological innovations in the field of food drying as well as provide good feedback on products related to price, brand, drying process and drying period

REFERENCES

1. https://en.wikipedia.org/wiki/Freeze-drying#Applications_of_freeze_drying
2. https://www.livestrong.com/article/509074-advantages-disadvantages-of-freeze-dried-food/
3. https://www.spscientific.com/freeze-drying-lyophilization-basics /
4. https://science.howstuffworks.com/innovation/edible-innovations/food-preservation4.htm
5. https://www.acmeplastics.com/content/advantagesacrylic/#:~:text=One%20of%20the%20greatest%20advantages,more%20impact%2Dresistant%20than%20glass
6. https://www.spscientific.com/freeze-drying-lyophilization-basics/
7. https://www.vitality4life.co.uk/blog/product-reviews/food-dehydrator-reviews/benefits-of-a-food-dehydrator