POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

INNOVATION OF BREAD CUTTING AND PACKAGING MACHINE FOR SMALL MEDIUM INDUSTRIES

MUKESS MUNIANDI	**08DMP19F1086**
NISHA RATHAKRISHNAN	**08DMP19F1077**
GLORY PETER	**08DMP19F1093**

MECHANICAL ENGINEERING DEPARTMENT

SESI 1 : 2021/2022

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This report is submitted to the Department of Mechanical Engineering as part of the conditions for the award of the Diploma in Mechanical Engineering (Packaging)

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DECLARATION OF AUTHENTICITY

AND PROPERTY RIGHTS

INNOVATION OF BREAD CUTTING AND PACKAGING MACHINE FOR SMALL MEDIUM INDUSTRIES

1. We, **MUKESS A/L MUNIANDI (NO KP: 011013-02-0101), GLORY PETER (IC NO: 010629-01-1874), NISHA A/P RATHAKRISHNAN (IC NO: 010922-10-1342)** is a student of Diploma in Mechanical Engineering (Packaging), Sultan Salahuddin Abdul Aziz Shah Polytechnic, whose address i**s** **Persiaran Usahawan, Section U1, 40150 Shah Alam, Selangor. (Here in after referred to as 'the Polytechnic').**

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MUKESS A/L MUNIANDI (NO.IC: 011013-02-0101)	)…… *mukess* ……..) MUKESS A/L MUNIANDI
GLORY PETER (NO.IC: 010629-01-1874)	) ……*glory*……..) GLORY PETER
NISHA A/P RATHAKRISHNAN (NO.IC: 010922-10-1342)	) …….*nisha*……..) NISHA A/P RATHKRISHNAN
PN GIHA BINTI TARDAN (730820-09-5313) as Project Supervisor on the date: ……..…….	)) ……..……..…….) PN GIHA BT TARDAN

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ABSTRACT

This study developed a compact front-loading machine for slicing loaves of bread. It absolutely was designed to accommodate a traditional loaf of bread per pass. It automatically stops saving running costs once the loaf is totally sliced. This research study was undertaken to develop a low-cost bread packaging machine suitable to be used by small-scale bakeries that handle about 1000 to 3000 loaves of bread daily to enhance the prevalent manual bagging practice. The goal of this research is to create a bread slicer and packager with adjustable guides that will enhance loaf alignment and speed up the slicing and packaging process. To fabricate a bread slicing mechanism can be worked manually and electrically for uses a power screw to feed the bread loaf into the slicing blade. This study aims to a bread-slicing and packaging system makes slicing and packing bread at the same time much simpler and less stressful. An evaluation of the literature per bread packaging machines and their components was done to develop a strong design. The machine's three design concepts were generated, and an improved heat press packaging mechanism was further developed into a close design. An assembly and part drawings were also done to enable manufacture within the future. The planning could further be improved on the plastic clip closure mechanism for effectiveness. The fabrication continues by soldering and joining all selected elements. Functionality test performed to ensure the best performance in any riding condition. The results analyzed to defeat problem and solution offered attain design purposes. Product and market review, financial management and mass production study engaged ready for market viable. The implementation of this project can have a positive impact on the assembly scale of the small-scale bakery. It is concluded that the desired goals are accomplished and executed effectively. Finally, there's a slot for the bread which is sliced will package neatly. Product resistance to cutting, moisture content, slice length, cutting speed, total power demand, and power supply are factors to consider while designing the machine. To summarize, this project focuses on designing and manufacturing a bread cutter and packaging to merge design, science, and technology to create functional and appealing products for customer.

ABSTRAK

Kajian ini membangunkan mesin pemuatan hadapan padat untuk menghiris roti. Iasecara automatik berhenti menjimatkan kos berjalan sebaik sahaja roti dihiris sepenuhnya. Kajian penyelidikan ini dijalankan untuk membangunkan mesin pembungkus roti kos rendah yang sesuai digunakan oleh kedai roti berskala kecil yang mengendalikan kira-kira 1000 hingga 3000 keping roti setiap hari untuk meningkatkan amalan pembungkusan manual yang lazim. Matlamat penyelidikan ini adalah untuk mencipta alat penghiris dan pembungkus roti dengan panduan boleh laras yang akanmeningkatkan penjajaran roti dan mempercepatkan proses penghirisan dan pembungkusan. Untuk mengarang mekanisme penghirisan roti boleh dikerjakan secara manual dan elektrik untuk menggunakan skru kuasa untuk memasukkan roti ke dalam bilah penghiris. Kajian ini bertujuan untuk sistem penghirisan dan pembungkusan roti menjadikan penghirisan dan pembungkusan roti pada masa yang sama lebih mudah dan kurang tekanan. Penilaian literatur setiap mesin pembungkus roti dan komponennya telah dilakukan untuk membangunkan reka bentuk yang kukuh. Tiga konsep reka bentuk mesin telah dihasilkan, dan mekanisme pembungkusan penekan haba yang dipertingkatkan dikembangkan lagi menjadi reka bentuk yangrapat. Lukisan pemasangan dan bahagian juga dilakukan untuk membolehkanpembuatan pada masa hadapan. Perancangan boleh dipertingkatkan lagi padamekanisme penutupan klip plastik untuk keberkesanan. Fabrikasi diteruskan dengan mematerі dan menggabungkan semua elemen terpilih. Ujian kefungsian dilakukanuntuk memastikan prestasi terbaik dalam sebarang keadaan tunggangan. Keputusan yang dianalisis untuk mengatasi masalah dan penyelesaian yang ditawarkan mencapai tujuan reka bentuk. Kajian semula produk dan pasaran, pengurusan kewangan dan kajian pengeluaran besar-besaran yang terlibat bersedia untuk berdaya maju pasaran. Pelaksanaan projek ini boleh memberi impak positif kepada skala pemasangan kedai roti berskala kecil. Disimpulkan bahawa matlamat yang diingini tercapai dan dilaksanakan dengan berkesan. Akhir sekali, terdapat slot untuk roti yang dihiris akan dibungkus dengan kemas. Rintangan produk terhadap pemotongan, kandunganlembapan, panjang kepingan, kelajuan pemotongan, jumlah permintaan kuasa dan bekalan kuasa adalah faktor yang perlu dipertimbangkan semasa mereka bentuk mesin.Ringkasnya, projek ini memberi tumpuan kepada mereka bentuk dan mengeluarkan pemotong roti dan pembungkusan untuk menggabungkan reka bentuk, sains dan teknologi untuk mencipta produk yang berfungsi dan menarik untuk pelanggan.

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1.1 Research Background

Bread shelf-life, bakery product shelf-life, gluten-free bread shelf-life, bread staling, bread spoilage, sourdough, bread packaging, active packaging, bread and nanotechnology, bread and nanoparticles, bread and silver nanoparticles, bread and montmorillonite, bread and essential oils, and bread and antimicrobial were all used. Mold is inactivated by heat during the baking process, thus fresh bread is mold-free; nevertheless, loaves can be contaminated by mould during cooling, chopping, packing, and storage since bakery air is not sterile and can be a source of contamination.

1.2 Define Research Title

The ability to help the bread loaf and guide the slicing knife with care necessitates close attention. The device is made up of a simple, efficient, and trustworthy unit thatis meant to cut costs, reduce downtime, enhance performance, accomplish effective slicing, and eliminate blade deformation during operation.

1.3 Project Introduction

A bread-slicing and packaging machine makes slicing and packing bread at the same time much simpler and less stressful. As a result, a machine that ensures little or no human interaction during the slicing and packing process is a welcome improvement. Compared to our bread slicing and packing machine, the manual process needs more human resources and takes longer. It also cuts down on waste, encourages evensharing, and boosts the retail value of sliced bread, depending on the uniformity with which it is prepared and packed. A bread slicing mechanism that employs a power screw to feed the bread loaf into the slicing blade can be operated manually orelectrically.

1.4 Problem Statement

- Manually cutting and wrapping bread affects productivity, it takes a long time to manufacture sliced and packaged bread.
- The hygiene of the food is harmed by much human touch during the manual operation of bread cutting and wrapping.
- More people are needed for the manual process.

1.5 Objective Of Project

- To analyse the bread packing issue aims to eliminate unnecessary bread handling during manual packaging, high defect levels before and after packaging, such as incomplete seals, must be dealt with.
- This study aims to a bread-slicing and packaging system makes slicing and packing bread at the same time much simpler and less stressful.
- To fabricate a bread slicing mechanism can be worked manually and electrically for uses a power screw to feed the bread loaf into the slicing blade.

1.6 Project Scopes And Limitations

- This device will ensure no human contact during the slicing and packaging process to help with hygiene. Stakeholders, on the other hand, are worried about sanitation during the slicing process.
- This unit is only for the cutting and wrapping of bread. Just one loaf of bread can be sliced and packed at a time by this unit. This computer is only for IKS use and is not ideal for large-scale manufacturing.
- This unit can only cut bread loaves with a length of 15-20 cm and a height of 12-15 cm.

CHAPTER 2

LITERATURE VIEW

2.1 Introduction

Packaging has played a significant role in containing and protecting food as it moves through the availability chain to the patron, as the study layout was first designed and intensive literature searches for papers on major literature databases associated with over the years, packaging has played a significant role in containing and protecting food as it moves through the availability chain to the patron. It reduces waste in transportation and storage, and advances in packaging materials, design, and labelling open up new ways to improve efficiency. It's been an important part of overall product design for a long time.

Packaging is essential because it ensures that the item is protected and in good physical condition. Bindon and Thomas presented a bread slicing guide device in 1995 that supports and holds various sized bread loaves while aligning the slicing knife; it also has an electrical fan for garbage collection via aspiration. Birmingham (1978) designed a bread slicer having several grooves in the base plate that allowed the slicing guides to be placed in different positions to accommodate different loaf sizes. No lateral holding force may be given to the loaf during slicing due to bread differences. The slicer, however, can only cut a specific length of bread because the guide is fixed rather than flexible

Bread slicing machines were constructed by Olatunji and Olowojoba (2008), Odior et al. (2009), and Oladejo et al. (2015), all of whom employed an influence screw to feed the bread loaf to the reciprocating slicing blade and could be controlled both manually and electronically. The installation of a second motor to drive the ability screw makes these machines more expensive; yet, their fundamental problem is that the shaft power output is insufficient to allow the blade frame to reciprocate as indicated. Bayo (2006) and Abu et al. (2014) aimed to improve the planning process by employing a variable speed motor and an adjustable guide.

Since the enormous manufacturing equipment are too big for their needs, many small to midsize bakers resort to manual production methods. Most small-scale bakers' bread and other items don't appear to be packaged, except in simple paper or plastic bags to protect them from dust and other contaminants. The current trend is for bread to be prepared close to consumers' homes so that it may be delivered fresh.

In a number of heavily populated areas, small-scale bakeries can be found. Small businesses frequently use clear, imprinted plastic bags to package their goods. Bread is a basic meal created from baking flour and water dough all around the world. It can be made leavened or unleavened. Salt, oil, and a leavening agent such as yeast are common ingredients; however, other ingredients like as milk, egg, sugar, spice, fruit, vegetables, nuts, or seeds may also be used. Bread slicing lowers waste, allows for equitable distribution, facilitates packaging, and raises the market price of bread. Mixing and kneading the dough, fermentation, division, and gas reproduction, moulding, and baking, as well as slicing and packing, are all part of the bread-making process in a bakery.

More human intervention in the final stages of the bread-making process resulted in the study's conclusion. Small-scale bakers sell bread without solicitation, leaving the work to the customers. The primary function of the package is commonly thought to be food protection: to shield its contents from all surface environmental effects. Primary, secondary, distribution or tertiary, and unit load packaging are the four types of packaging.

2.1.1 Modern Industries

The bread packaging machine that will be designed will be aimed at the first packaging. There is still a lot of manual food handling in modern industries that are under pressure to reduce packaging costs. Bakeries typically specialise in bread-making equipment, with packaging being an afterthought. Typically, workers are assigned the task of manually packing the bread. Customers' health may be jeopardised if manual handling is not done correctly. It's also worth noting that some small-scale bakeries, particularly in-store bakeries, sell unpackaged bread to customers. Buyers will also pack their bread by hand, with little regard for hygiene. In order for small-scale producers to grow, they must improve the quality of their products as well as their productivity.

Automation at a low cost can be used to improve quality and productivity. It is agreed that low-cost automation includes the use of common components to mechanise or automate machines, processes, and machines. Because low-cost automated machines require little human intervention, semi-skilled or unskilled labour is required for operation. Plastic packaging relies heavily on sealing. The various sealing techniques differ in terms of cost, speed, and quality. For the production of flexible packages, various sealing technologies are used.

Figure 2.1: Bread Slicing Machines

2.2 Material

Description of the machine working components.

The total assembly dimensions of the machine are 600 mm x 500 mm x 1000 mm. The machine is constructed of a set frame and a reciprocating blade frame, as well as a crankshaft, driven shaft, crank wheel, connecting bars, in-feed and out-feed crumbs trays, keys, pulleys, plumber bearings, bolts and nuts, blade holder, and blades. The fixed frame is made of a 5 mm thick soft-cast steel square pipe with a cross-sectional dimension of 40 mm x 40 mm. It's welded together to form cuboid frames measuring 600 mm x 600 mm x 700 mm. The bottom plate of the electrical motor is mounted at a vertical height of 200 mm on the fixed frame, and the crankshaft is suspended at a vertical height of 400 mm. The action is transmitted from the connecting bar to two reciprocating frames with blades measuring 400 mm x 200 mm via the driven shaft.

Two plumber bearings hold the crankshaft in place on the machine frame, and the rod is fifty millimetres from the centre of the crank wheel to allow the blade mechanism to reciprocate. Connecting bars are rectangular soft-cast steel bars having a diameter of 558 millimetres. They're two in number, and they're connected by the gauge on pins and sleeves, allowing for friction-free reciprocating movement. The primary connecting bar is connected to the crank wheel, while the secondary connecting bar is connected to the blade mechanism's driven shaft. Each slicer blade is 15 mm wide and 250 mm long, and is made of 15 mm thick AISI 410 chrome steel with serrated teeth. They're separately attached to the blade holder using M 6 5 mm fasteners (bolts and nuts) and spaced at a distance of 14.5 mm apart to reinforce replacement. To avoid food contamination, the infeed, outfeed, and crumbs trays are composed of two.5 mm thick AISI 410 stainless steel to prevent corrosion, rust, and wear. Bolts and nuts were frequently utilised to connect the above-mentioned components, making disassembly and replacement of broken parts simple.

2.3 Material Selection

The material utilised in the Bread Cutting Machine's design was chosen for its efficiency. This was accomplished by choosing materials that were in good working order and had a high level of component stability. The specifications for the Bread Cutting Machine's essential component are shown below. Among these are the Pneumatic Cylinder, Stainless Steel Plate, and Stainless Steel Blade.

2.3.1 Pneumatic Cylinder

Pneumatic cylinders (also known as air cylinders) are mechanical devices that generate force through a reciprocating linear motion using a propellant. Similar to hydraulic cylinders, something causes a piston to move in the desired direction. The connecting rod is responsible for distributing the force created by the piston, which can be a disc or a cylinder, to the item to be pushed. Pneumatic machines are preferred by most engineers because they are quieter, cleaner, and require less space for fluid storage. Because the operating fluid in a pneumatic cylinder may be a gas, leakage from the cylinder will not fall out and contaminate the environment, making pneumatic more suitable when cleanliness is required.

A double-acting cylinder's extension and retraction strokes are both powered by compressed gas, allowing it to move back and forth. They are ideal for both pushing and pulling loads in the same application because of their arrangement. Superior speed control is available with double-acting cylinders by adjusting the pace at which air escapes.

Figure 2.2: Pneumatic Cylinder

2.3.2 Stainless Steel Plates

Figure 2.3: Stainless Steel Plates

Stainless steel plates are accustomed to fabricating the body of the bread cutting and packaging machine. There are many benefits and advantages to using these plates.

i. Corrosion Resistance – Chromium is that the alloying element that imparts to stainless-steel their corrosion-resistant qualities. Lower alloyed grades resist corrosion in atmospheric and pure water environments; high-alloyed grades can resist corrosion in most acids, alkaline solutions, and chlorine bearing environments making their properties useful in process plants.

ii. Fire and warmth Resistance –Special high chromium and nickel-alloyed grades resist scaling and retain high strength at high temperatures. Stainless steel is employed extensively in heat ex-changers, super-heaters, boilers, feedwater heaters, valves, and mainstream lines furthermore as in aircraft and aerospace applications.

iii. Hygiene – It's possible that cleanliness is a top priority. Stainless steel is the preferred material for rigorous hygiene environments such as hospitals, kitchens, and food processing plants due to its ease of cleaning.

iv. Aesthetic Appearance –Stainless steel has a vivid, easy-to-maintain surface that gives it a modern and appealing appearance.

v. Strength-to-Weight Advantage – The work-hardening property of austenitic grades, which results in significant fabric strengthening from cold-working alone, and hence the high strength duplex grades, allows for thinner material thickness than conventional grades, resulting in significant cost savings.

2.3.3 Stainless Steel Bread Slicer Blades

A group from a commercial bakery Sets that are precisely measured and matched. Edge profiles and widths for bakery slicing band blades include 12" and 14" scallop, v-tooth, precision honed on one or both sides, and single or double levelled.

This setting ensures that the best blade is accessible for all slicing jobs involving bread and buns. The bakery and bread slicing blades are ideal for wholesale and commercial bakeries because they reduce bread ripping and crumbling. As a result, less bread is thrown away, the slices are cleaner, and the bread looks better. Cutting-edge machinery is used to grind them, blades are shifted to the proper length, and bands are welded. Finish bread slicing bands are meticulously matched to incredibly tight tolerances to assure equalised force on your slicing machine and minimal breaking. The bakery band blades' edges are burr-free, producing in consistently smooth, flat, and clean slices.

7/16" .016" BKDB Scallop
The BKDB band saw blade has a secondary bevel for easier penetration and a smoother finish, similar to the BK edge. The secondary level will make it easier for users to hone their skills.

Figure 2.4: Stainless Steel Blades

The BKDB is ideal for soft crusted, light-textured slices of bread to prevent crumbling, ripping, and straining. This versatile bread slicer blade is used for a variety of production applications because of its high finish and long blade life.

Welded Blades vs. Brazed Blades

Welded joints are more durable and endure longer than brazed ones, according to experience. As a result, we exclusively sell bread slicing blades with welded joints. Welded connections provide excellent long-term strength and can withstand the strain and bending loads encountered during the delicate slicing of bread and buns. Because we utilize specifically chosen steel that has been proved to withstand strain and stress, our welds are stronger. Flash-butt welding is used by all of the world's major band saw manufacturers.

We were the first to apply this challenging method to the slicing of thinner-gauged bread and buns. Other businesses choose the weaker braze approach because it is a cleaner and less expensive manufacturing process. Brazed Joint: Brazing generates a joint that requires a lot of shaping. The process begins with the use of a brazing alloyto join the two ends and flux to moisten the molten braze and form the connection. Asa result, the brazed joint necessitates the optimization of three factors, and the outcome is a bread slicing blade that is less robust and dependable. Other Specialized Sectors Use Flash-Butt Welding Flash-butt welding is widely used in other specialized industries. No foreign elements are used to hold the joint together, resulting in a blade that is stronger and lasts longer. The flash butt weld melts virgin steel into a smooth joining that is very strong and nearly indestructible. When you compare the brazed junction to the integrally-fused flash-butt weld, you'll notice that the brazed joint is three times more likely to create issues.

2.4 Chapter's Summary

To finish this chapter, it is important to present all studies of materials and methods in order to improve the understanding of this project. Every thesis and other project relating to this cutting and packaging machine allows us to understand it fully. Especially for us. After a lot of materials and methods were discussed and researches were done, these objects have their own benefits from many perspectives. After conducting a study on the materials and components needed to build this project, it was found that componentswith appropriate specifications should be used to prevent accidental accidents.

CHAPTER 3 : METHODOLOGY

3.1 Research Design

The authors developed three different potential bread packaging ideas for small-scale bakeries based on what they learned from the current literature in the previous parts. The sketches for the various solutions were made on paper. The concept design for the heat sealer and trimmer was chosen based on the importance of dependability, cost,and simplicity of production. Small-scale bakeries use it for the majority of their bread packing.

3.2 Flow Chart Explanation

Following figure below shows how the methods established in this study was put to use. To take full use of the versatility and capability for 3d modelling, we started with product design employing Autodesk Fusion 360 software. After making the best design decision, move on to material selection and components component selection to complete the project requirements. Students fabricate the product using a pneumatic cylinder, stainless steel plates, and an electric motor in the following stage. After that, the product was put to the test in a real environment and examined by our supervisorto see how it worked.

3.3 Flow Chart

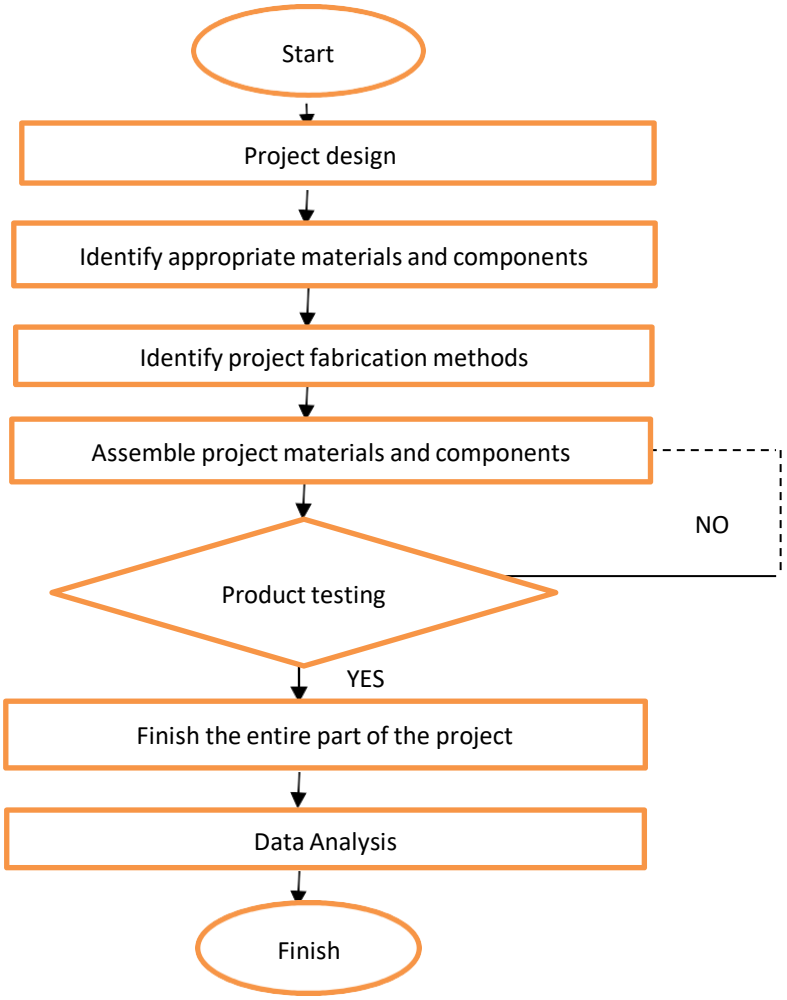

Figure 3.1: Project Flow Chart

3.4 Operational Methodology

In the bread slicing assembly, an electric motor drives a slider-crank drive mechanism and a gravity in-feed machine, which creates a reciprocating motion. The unit is made up of blades that are vertically fixed and mounted on a blade frame. To join the blade ends to the blade base, M 6x5 mm fasteners are used (bolts and nuts). The blade assembly is attached to the reciprocating drive mechanism, which drives it up and down within a frame guide to create the cutting action on a loaf of bread. The loaf is fed by a gravity in-feed machine in the absence of a pushing pan, and crumbs are deposited in the crumb tray.

3.5 Project Design

A rough geometric layout is the idea of how the elements of the bread cutting and packaging machine will be arranged and assembled. Figure 3.2/ Figure 3.3 and Figure 3.4 shows the rough geometric layout of the machine.

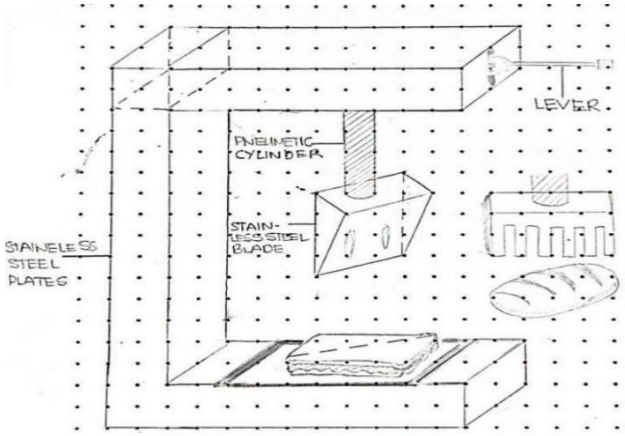

Figure 3.2: First Design

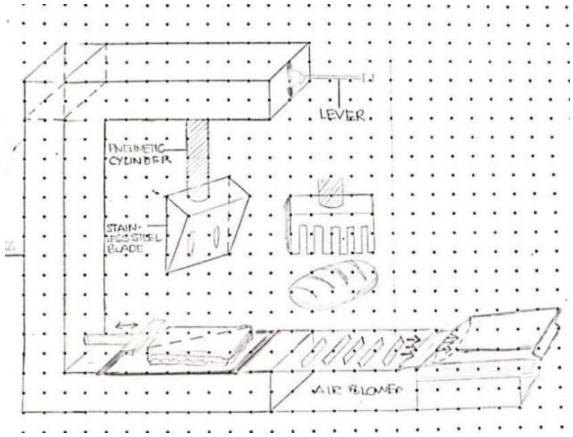

Figure 3.3: Second Design

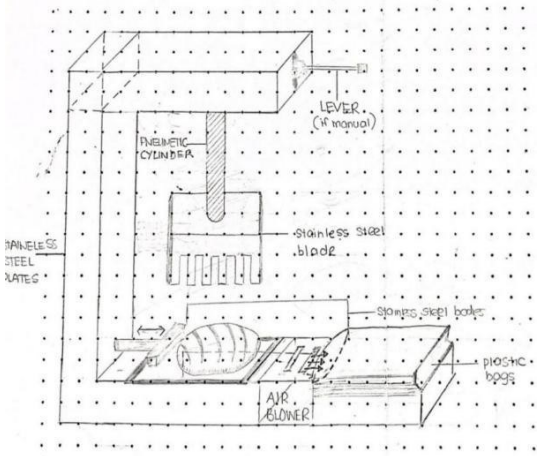

Figure 3.4: Finalized Design

3.6 Methodology

The pneumatic cylinder attached to the fabricated stainless-steel body is placed vertically above the bread cutting area with specific bread slicing blades. One arm pusher from the side of the body will push the slide bread across the slate once the cylinder slices the bread loaf. Bread from one side will moved by it and then pushed by an arm into the packaging material which will be constantly aired opened by an air from the bottom of the fabricated stainless-steel body.

This portion wouldn't need any downtime for machine cleaning because it'd vacuum continuously. The jaw is at risk of high temperatures and will be protected to forestall human contact. Bread should be amended out of the oven, and a machine should be designed to eliminate manual handling. For this unit, the bread should be put around the same distance. The packed bread must be far from the dispatch transporter. This could be made more accessible, and more packages will be created. The jaw that heats presses, and trims packaging material may be calibrated for friction, humidity, and dwell time.

It then can be closed by the packaging people manually and then makes one end ready to for the next loaf to be packed. This slate transports the bread to a bag closure mechanism particularly the plastic clip machine. After that bread is now ready for secondary packaging. Material selection was done and the necessary parameters for the materials were noted where they were necessary for calculations.

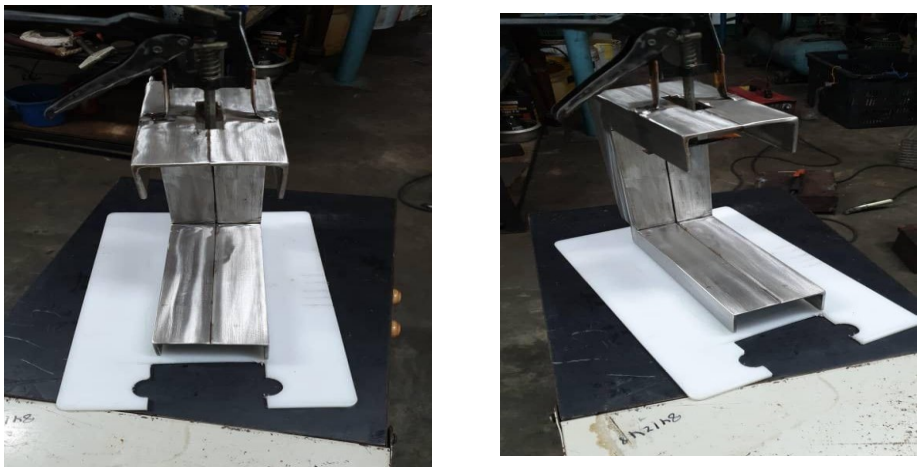

Figure 3.5 : Fabricated Stainless Steel Body

3.7 Budget Calculation

The overall cost of bringing this facility into service was RM 549.60, with the gross cost of the bread packaging machine components being RM 429.60 and the cost of constructing the equipment being RM 120.00 Small-scale bakeries should prepare for and buy a bread packing machine based on an estimated daily output of 2000 loaves of bread and the expense of the bread, which is RM 4.50. Costing and materials for the designing machine is shown in Table 3.12.

Table 3.2: Costing

ITEM	SOURCE/ CATALOG	QUANTITY	PRICE per unit (RM)	TOTAL PRICE (RM)
Standard Cylinder C/W Magnet	SUN-RISE H & P SDN.BHD	1 PCS	137 .00	137 .00
3/2 Way Mechanical Valve 1/4 Mushroom Head Push Button	SUN-RISE H & P SDN.BHD	1 PCS	65.00	65.00
5/2 Way Mechanical Valve 1/4 Flat Head Push Button Type (RED)	SUN-RISE H & P SDN.BHD	1 PCS	107.00	107.00
Tubing	SUN-RISE H & P SDN.BHD	12 MTRS	5.00	60.00
Male Stud Fitting 8mm x	SUN-RISE H & P	2 PCS	3.00	6.00

1/8	SDN.BHD			
Male Stud Fitting 8mm x 1/4	SUN-RISE H & P SDN.BHD	2 PCS	3.00	15.00
Brass Silencer 1/8	SUN-RISE H & P SDN.BHD	2 PCS	3.00	6.00
Brass Silencer 1/4	SUN-RISE H & P SDN.BHD	1 PCS	3.00	4.00
Speed Controller 8mm X 1/8	SRMY PNEUMATICS (M) SDN BHD	2 PCS	10.50	21.00
Male Stud Fitting 8mm X 1/8	SRMY PNEUMATICS (M) SDN BHD	2 PCS	2.80	5.60
Male Stud Fitting 8mm X 1/4	SRMY PNEUMATICS (M) SDN BHD	1 PCS	3.00	3.00
Total Cost				429.60

3.8 Project Activity

THE PRINCIPLE PROCESS ARE CLASSIFIED AS:

i. MACHINING

ii. JOINING

iii. SHEARING AND FORMING

i. In the bread slicing assembly, the manufacturing method is termed machining. During this process, A machine or tool is used to carve away at stuff. Tools like saws, shears, and rotating wheels are accustomed cut the part into its desired shape. Some machining procedures in the workplace are completed by hand or fully by an automated machine.

ii. Another manufacturing method is named joining. This process takes twosmaller components and connects them using welding, soldering, fasteners, or adhesives. The kinds of parts being joined and therefore the materials madesupported joining.

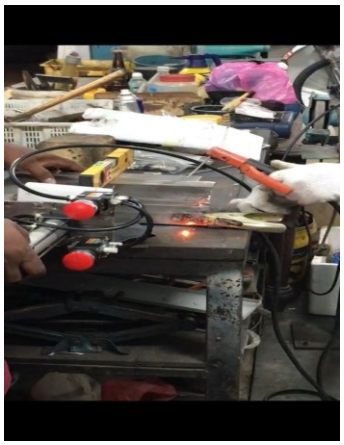

Figure 3.6: Manufacturing Method

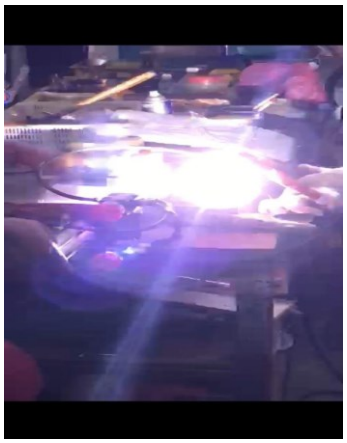

Figure 3.7: Welding

iii. The last traditional method of producing is shearing and forming. This sort of production uses blades to chop through sheets. Die-cut parts fall under this category. A die may be specialized to chop or shape material employing a press. Forming is when a cloth is compressed into its final shape.

Parametric Design

Parametric design is used to define values for design variables in order to generate the best design feasible in terms of performance and cost. The variables and their details for the machine are shown in Table 3.1.

Table 3.1: Variables and its Details

Variables	Details
3/2 Way Mechanical Valve 1/4 Mushroom Head Push Button	Port Size: 1/4'' Material : Aluminium Alloy Manufacturing process: Joining
Standard Cylinder C/W Magnet	Size: - Length : 121mm - Diameter : 19 .7 - Weight : 109g Material: Stainless Steel Manufacturing process: Joining
Stainless Steel Plate	Size: Material: Stainless Steel Manufacturing process: Machining, Joining, Welding
Stainless Steel Blade	Size: Material: Stainless Steel Manufacturing process: Machining
5/2 Way Mechanical Valve 1/4 Flat Head Push Button Type (RED)	Port Size: 1/4'' Material: Die Cast Aluminium Manufacturing process: Joining
Tubing	Size: 12 meters Material: Cross Linked Polyolefin Manufacturing process:
Speed Controller	Size: 8mm x 1/8 Material: Resin Manufacturing process:

Male Stud Fitting	Size: 8mm x 1/4 Material: Nickel Plated Brass Manufacturing process:Joining, Fasteners
Brass Silencer	Size: 8mm x 1/8 Material: Nickel Plated Brass Manufacturing process:
Male Stud Fitting	Size: 8mm x 1/8 Material: Nickel Plated Brass Manufacturing process: Joining,Fasteners

3.9 Design Drawing Using Cad Software

The final design of bread cutting and packaging is made by using AutoCAD software. The final design is shown Figure 3.7.

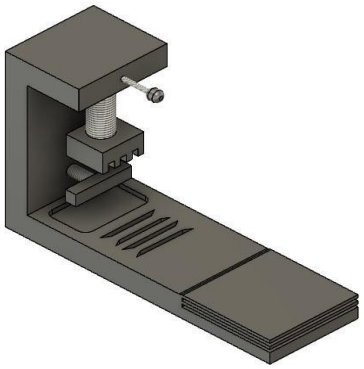

Figure 3.8: Isometric View

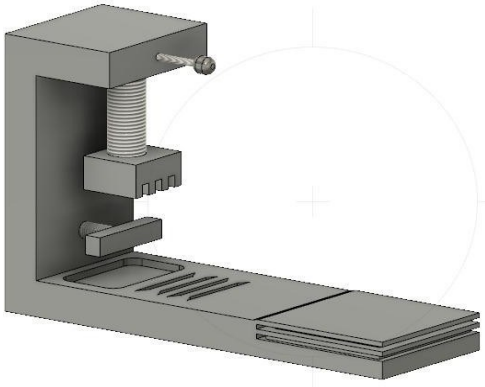

Figure 3.9: Front View

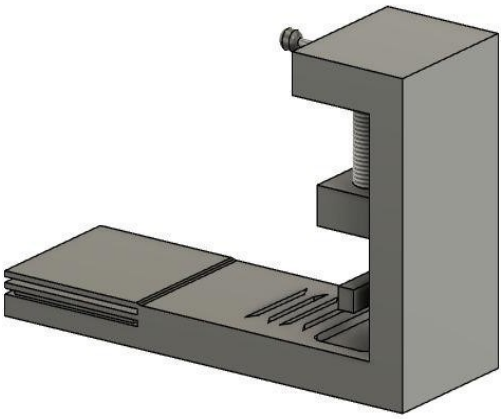

Figure 3.10: Side View

3.9.1 Design Specifications

The machine's specs and specifics will be specified throughout the design process in order to determine the machine's limitations. The parameters and specifics for developing the machine are shown in Table 3.3.

Table 3.3: Specifications and Details

Specifications	Details
Power	2 bar/ 29.0075 PSI
Duration time operating	5kg
Weight	Down and up 1-5s
Rotational speed	8x10
Size	11’’x 4’’x 12’’
Setup time	10 in

3.10 Fabrication

Various issues were discovered during the initial preliminary testing of the bread slicing machine. The issues range from size of the pneumatic cylinder to main shaft wobbling and a faulty condition. As a result, several components were redesigned, modified, or replaced, including:

i. Main shaft

The primary shaft wobbled due to a lack of support, for which just one support was initially employed. A support was made out of a 200mm long 30mm diameter pipe. The primary shaft was restrained by the support to provide smooth and steady.

ii. Pneumatic cylinder

During slicing, there was a lot of shattering of the cut bread. This is due to the pneumatic cylinder's orientation. The cylinder had to changed the length to 10mm as a result.

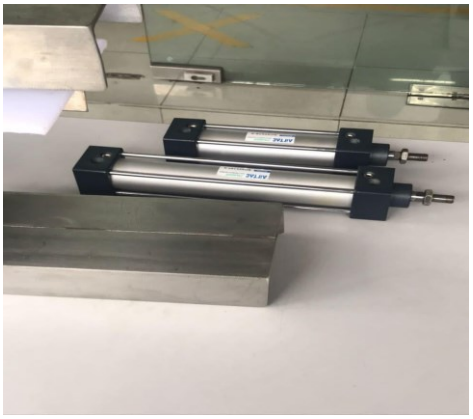

Figure 3.11: Pneumatic Cylinder Orientation

3.11 Chapter’s Summary

While most small-scale bakeries sell bread unnoticed, some machines can have a slicing mechanism. Using methods like MATLAB, the machine's electric controlmachine could be meticulously designed and modeled. A bag closure machine and a plastic clip unit can be purchased along with the device. The electric motors inconveyor machines often require three-phase electric power. The printed and sealed part of the plastic that would be used for wrapping should be printed. Before beginning the packaging process, if the packaging content is not sealed, a device toseal it should be used. A self-cleaning machine may be installed to eliminate the need for manual cleaning. In the methodological study, the sample design, as well asselection techniques, test equipment, data sampling, and data analysis methods, are all carried out in a systematic manner in order to learn the details and knowledge requiredto support the testing instrument and to be explained more explicitly in this paper. The findings and assumptions of the trap's success or failure must be checked or inferred after reviewing the evidence.

CHAPTER 4 : FINDINGS AND ANALYSIS

4.1 Introduction

This chapter combines "The bread cutting and packaging machine's" data and interpretation, as well as material estimates. This data and analysis are critical to the project's success in meeting its goals and scope. This information suggests that the materials testing was satisfactory. After gathering all of this information, we examine every detail in order to make it perfect. The information in this section will focus on the finer points of writing up our conclusions and discussing them. We'll follow the Description – Analysis – Synthesis model, which is usually what readers expect to see in these two pages. To aid in the improvisation of our results, we used some kind of software program. We use a software program like Google Forms to help us get responses to our feedback form. The project design was successfully proposed and fabricated according to the designed material and project fabrication, as shown in Figure 4.1/ Figure 4.2/ Figure 4.3.

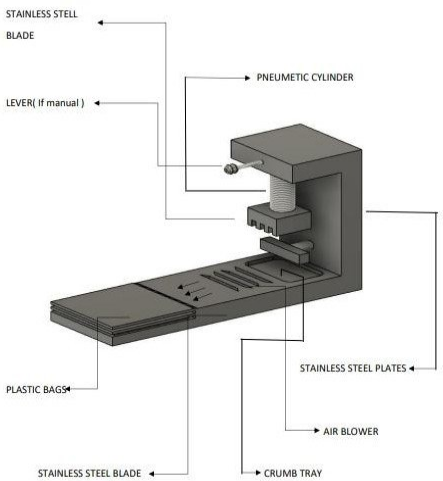

Figure 4.1: Project Design

Figure 4.2: Fabricated Designed Material

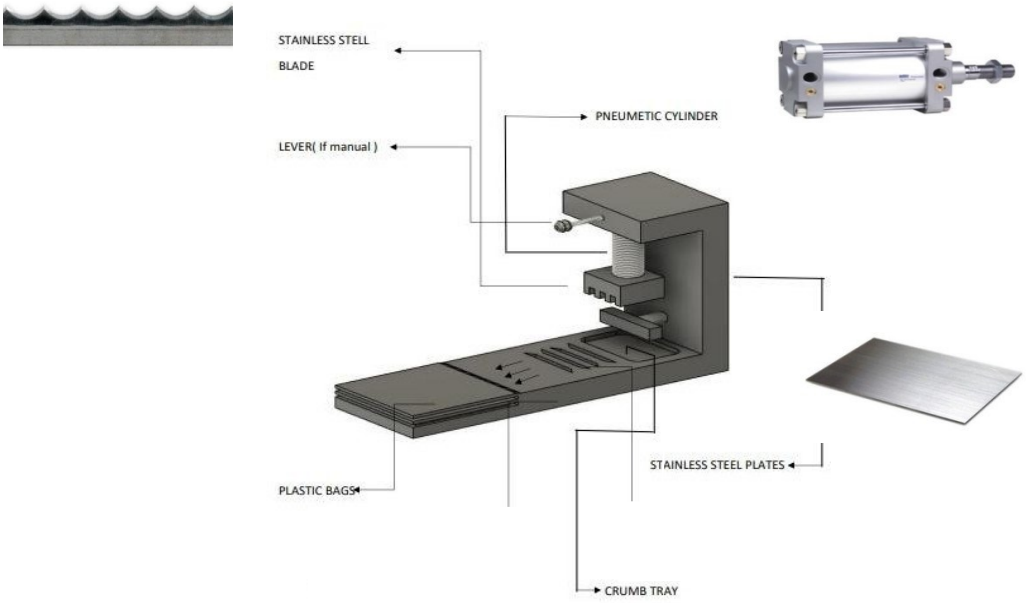

Figure 4.3: Project Fabrication

4.2 Advantages

i. Save time - Our working time can be cut in half with the use of a slicer. Our ability to set up to pack up will be immediately achieved after the bread has been cut or slashed. There will be no more frequent trips to the kitchen or stalls to slice and pack bread for long periods of time.

ii. Reduce labor requirements - Terrible knife skills are immediately eliminated by using a bread cutter and cutting and packaging skills are not needed because the bread cutter and packaging do all the work. A bread cutter was, in general, a simple contraption to keep up with. That it must be physically treated reduce labor costs by obviating the need for professional cutters. The transition to automated cutting and packaging is a significant labor market factor.

iii. Uniformity - The best thing about the bread cutter and packaging machine is how consistent the bread cuts or pieces are and packaged. If we cut a slice of bread, we will notice that the thickness of the slices is nearly identical. When it is totally sliced up, there's an unmistakable cut. Then it will neatly package.

iv. Energy saver - The machine was created to aid in increasing productivity and conserving energy, as well as lowering trader costs. It also helps to save electricity.

4.3 Test Run

The performance of the bread slicing machine was evaluated using loaves of bread with dimensions of 289 x 102 x 102 mm and a gross weight of 865 g. The bread slides towards the cutting blades due to the gravitational feed location of the bread on the crumb tray. The time it took to completely slice through the bread was recorded, as well as the amount of crumbs formed throughout the cutting operation. The cutters effectively sliced the bread into 20 identical 12 mm strips with minimum crumbs weighing less than 0.10 gramme weight. Finally, there's a slot for the bread which is sliced will package neatly.

Table 4.1 : Testing Design by Machine

PARAMETER \ NO OF TESTING	1	2	3	AVG
Setup Time (min)	5			
Time is taken to slice the Bread (min)	2	2	2	2
Time is taken to pack the Bread (min)	3	2.5	2	2.5
Neat slices	All			

Table 4.2: Testing Design By Manual

PARAMETER \ NO OF TESTING	1	2	3	AVG
Setup Time (min)	10			
Time is taken to slice the Bread (min)	7.3	7	8	7.43
Time is taken to pack the Bread (min)	3	6.5	6	5.17
Neat slices	No	No	Yes	No

Last but not least, the started objectives and aims achieved and implemented effectively. The % weight reduction, average time for slicing a loaf of bread, and efficiency of the bread cutting machine were derived as performance criteria for the bread cuttingmachine Figure 4.4 displays the successful design and assembled machine.

Figure 4.4: Finish Project Development

4.4 Analysis

We have analyzed and created one-of-a-kind designs and machines for unique productions. The patron is usually at the core of our philosophy, which has led us to require a path where the machine is intended to direct requirements and production needs from the beginning, most of the time producing something completely new and inimitable. Our strength is that we follow every single request from start to complete to know the wants and build a machine that's custom-made for the assembly requirements. It's therefore critical to start with an intensive examination of the manufacturing process and also the actual operating conditions under which the machine is used, additionally because of the easy use and maintenance, still as learning times.

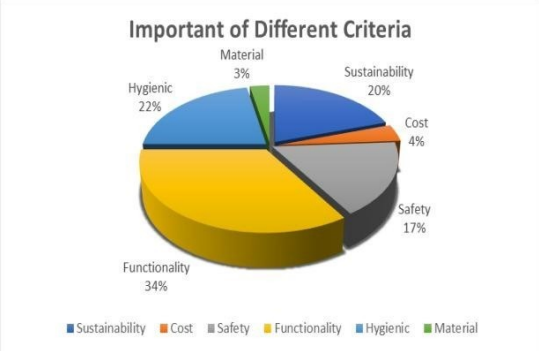

Figure 4.5: The Importance Of Various Parameter

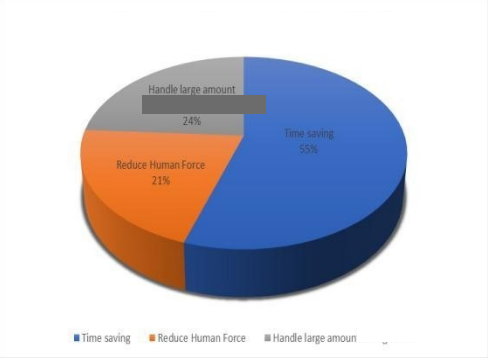

Figure 4.6: Advantages of Bread Cutter Machine

According to the survey results, 21 out of 40 respondents believe that a bread slicing machine will minimize the amount of time spent preparing food. The machine can process vast amounts of loaves and minimize human force, according to 24 percent and 21% of respondents, respectively.

The aim of this query is to determine the most essential characteristics of a bread cutter and packaging machine. The most critical criterion for the machine, according to the findings of the poll, is the machine versatility. According to the respondents, hygienic is a very necessary criterion for slicing machine, with 22% agreeing. Sustainability and protection are two of the most relevant requirements for each of them, accounting for 20% and 17% of the total. 4 percent of respondents believe that the machine's purchase price is the most important criterion, while another 3% believe that the machine built-up content is the most important criteria. Price, accessibility, content, and sustainability, for example, are all logically linked to one another. A higher sale price would benefit from a more functional slicing machine. The bread cutter and packaging machine, for example, helps the user to slice bread evenly. Material sourcing may also be linked to long-term sustainability. The cutter material for a slicing machine has been chosen to be stainless steel rather than alloy steel. Although alloy steel is lighter than stainless steel, stainless steel has a higher corrosiontolerance. In compared to stainless steel, stainless steel is stronger and has a better protective factor. Stainless steel, unlike alloy steel, is fire and heat resistant and retains its strength even at high temperatures.

4.4.1 Consumer Satisfaction Survey

The purpose of this questionnaire was to obtain public feedback regarding "Bread Cutting and Packaging Machine". This graph shows the result of a survey in which people aged 16 and over were asked about their preferred the bread cutting and packaging using a machine. As you can see the majority of people that completed my questionnaire were aged under 21. A total of 7.7% was aged 31-40 and 15.4% are adults. This will show through my results as the machine that people prefer to use to will appeal more to the younger generation rather than the older.

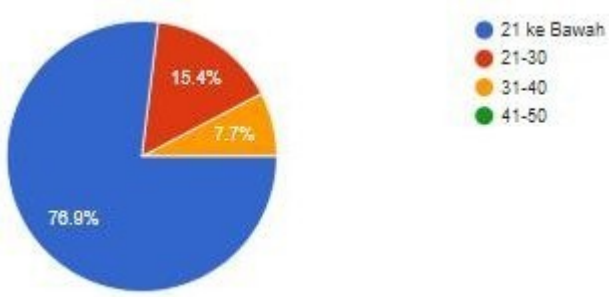

Figure 4.7 : Age

The pie chart shows that out of the 13 people completed my questionnaire, 38.5% of these were male and 61.5% were female. This is quite an equal amount so it should not affect my overall results drastically.

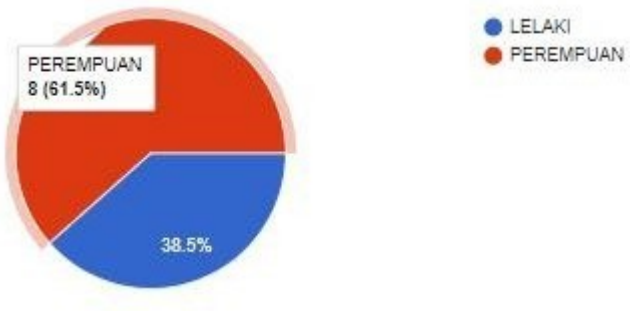

Figure 4.8 : Gender

The pie chart shows the design of this machine is ergonomic and neat of the people that were participants in the questionnaire. As you can see 92.3% were people said yes to target our machine for a younger generation so this will not affect my results as a lot of this audience will be students.

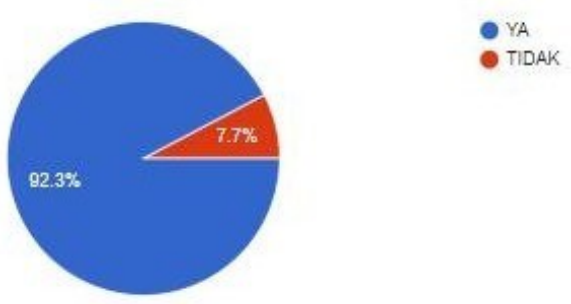

Figure 4.9 : The design machine is ergonomic and neat

This pie chart shows that 84.6% of people answered yes to use this machine and easy to operate.

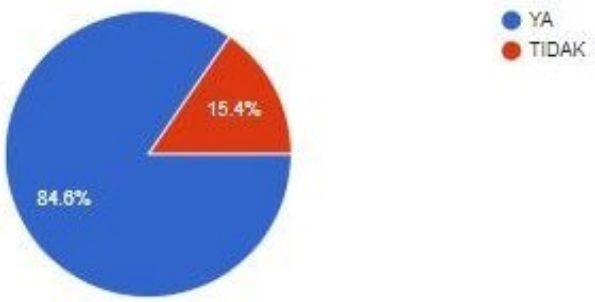

Figure 4.10 : This machine and easy to operate

Finally, the last question on my questionnaire asked if people would feel that this machine is necessary in society. We bring up this question because technology is becoming more popular especially with the younger generation. However, the majority of people said they would prefer a machine for bread cutting and packaging machine rather than manual which was quite surprising considering how much the use of technology has increased so we will create the machine.

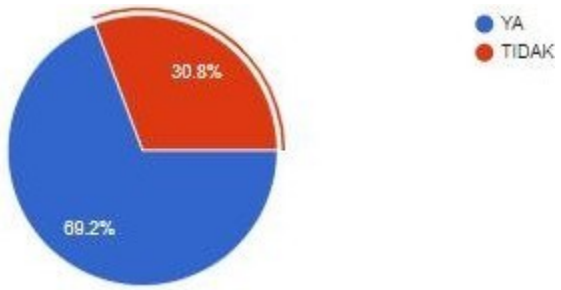

Figure 4.11 : Machine is necessary in society

4.5 Chapter’s Summary

For this part, the research and findings were completed. Each project has its own set of advantages and disadvantages that benefit both the people and also society. However, we should always boost or enhance the project's drawbacks within the future to extend the great and really profitable product which will hardly find the project's downside. As a result, the challenges are viewed as opportunities for future generations to develop and innovate, similarly to deepen their understanding of our project. Test runs are meted out to work out the project's maximum potential. Having corrected the observations made during the test, it had been observed that the machine can slice a loaf of bread if few blades are used, with more efficient slicing at the centerof the slider blade. Comparing this result obtained with the old existing design, the machine contains a higher efficiency.

CHAPTER 5 : DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The project's discussion, conclusion, and upgrade plan are all covered in this chapter. The research was conducted using data from the project's trial run. As a result, in this chapter, all the test run's outcomes and interpretation will be explained. Then, based on the discussion and enhancement plan that has been made.

5.2 Discussion

From component design to equipment manufacturing, we learnt how to manage an engineering project collaboratively and effectively. Our project supervisor and good communication enable us finish our work and improve our communication abilities as quickly as feasible. Finally, the automated slice machine helped us achieve our objectives. Our goal is to enable consumers to lower their human strength in food preparation in a short amount of time while also improving the safety of a bread slicing machine and neatly packaging it. The bread-cutting device was successfully produced. The project's key objectives have been completely met, with the machine allowing the firm to cut its workforce to just one person.

5.3 Recommendation

To enhance the performance of our bread cutting machine, we recommend replacing the HP speed controllable motor with the next speed controllable motor. A better horsepower speed engine would improve the performance of the machine. Therefore, we suggested replacing the engine with the next horsepower speed controllable engine to produce better output for all machine functions and operations. Additionally, our machine components are primarily manufactured from pf chrome steel, wood, and plastic and thus the load of the unit is kind of high. The scale of our prototype is greater and a few of the fabric is recycled. Bread is therefore expected to withdraw smaller pieces before the experiment is dispensed. We recommend that an actual size machine be built to confirm that an oversized quantity of bread is handled by the patron in a very short period of your time. Additionally, because of budget limitations, we discontinued the utilization of the IoT module and advanced programming tools. Our machine is primarily intended for commercial use. A complete bread cutting machine is suggested for the food and beverage industries

Our machine may be enhanced by employing an IOT module and programming software, but this may increase the cost of every machine. We also must improve the safety features of our bread slicing machine. Our prototype isn't completely covered to demonstrate how the mechanisms operate and there's no sensor accustomed to improve the protection of the machine. As a result, our machines are often strengthened by attaching a canopy to the ‘motor DC’ that forestalls the user from unintentionally putting his hand on that Last but not least, our prototype isn't a multipurpose cutting machine. We advise a multipurpose bread cutting machine that ispurposely designed to perform slicing operations. It'd be greater for traders to use within the market. Besides that, this could improvise into an innovative cutting machine and blade design. The innovative cutting method must be impressive. The cutting referred to as "gentle cut" ensures that the merchandise is cut in a mannerthat's managed and smooth which the strain is minimal. This bread cutting and packaging machine will be cut with extreme precisionand smoothness. The longer leading edge and extended service lifetime of the knives ensure higher efficiency furthermore as reduced effort and expense.

5.4 Chapter's Summary

As an improvement on current manually operated machines, a bread cutting gadget has been constructed utilizing locally accessible materials. The machine was created and built to make the task of processing bread cutters easier, hence improving quality, hygiene, and efficiency in small size companies. The average time it takes to slice bread using the machine is 5.05 seconds, which is much less time than the manual approach, which takes 15 seconds.

CONCLUSION

The machine eliminates packaging mistakes and is easier to use than having individuals package the bread. If the concept is implemented correctly, small-scale bakeries can increase production. The building and manufacture of this packing machine are very low-cost, allowing for a simple unit configuration. Effective sealing and bag closure machines, as well as total automation to eliminate human involvementduring service, are simple to implement. Locally accessible goods have been recommended as a means to further cut production costs. More study should be doneto decrease the heavy nature of the new design to improve robustness. Cutting blades (22 set), blade base, in-feed and out-feed tray, crumbs tray, in-feed weight, and the driving mechanism were all designed and built in this research for the bread slicing machine. The technology would benefit slicing operations by reducing vibration, generating little noise, lowering costs, and providing a clean, high-quality slicing environment.

The project design was successfully proposed and fabricated according to the designed material and project fabrication. According to the results of the performance test, very smooth slices were obtained when the machine was operated at the standard speed of 420 r/min. The bread slicer's gravity in-feed tray, out-feed tray, and crumbs tray may all be motorized, allowing it to run completely automatically and reduce operator tension. The project's key objectives have been completely met, with the machine allowing the firm to cut its workforce to just one person. Our goal is to allow consumers to minimize the human power required for food preparation while also improving the cutting machine's safety features by cutting and packaging huge quantities of bread in a shorter amount of time. Finally, there's a slot for the bread which is sliced will package neatly. Last but not least, the started objectives and aims achieved and implemented effectively. For the cutting and packing procedure, the consumer must cut several types of bread. The government should support the mass manufacture of suitably dependable locally produced bread slicers like the one detailed in this post since they are less expensive than imported bread slicers.

QUESTIONNAIRE ITEMS

DEMOGRAPHY

PART A -BACKGROUND OF THE RESPONDENT

Please mark "/" in the answer choices in the box provided.

1. Gender

( ) MALE

( ) FEMALE

2. Age

( ) <20

( ) 21 – 30 years

( ) 31 - 40 years

( ) 41 years and older

3. Please mark "/" in the answer choices in the box provided.

No	Question	YES	NO
1.	Is the time taken by a machine to cut and wrap bread more efficient than the human energy to cut and wrap bread?		
2.	Is the bread cutting process the same size or flat as the cutting process used by manpower?		
3.	Can this machine save electricity and cost of traders?		
4.	Is this machine save to use?		
5.	Is this machine is easy to maintain?		
6.	Is the process of operating this machine is diffcult?		
7.	Is the design of this egronomic and neat		

SCHEDULE

PROJECT ACTIVTY PLANNER

CARTA GANTT PROJEK 1

MINGGU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AKTIVITI PROJEK															
Pengenalan garispanduan kursus projek															
Perbincangan untuk pemilihan projek															
Membuat lukisan projek yang dipilih oleh setiap ahli															
Pembentangan untuk pemilihan projek															
Keputusan pemilihan projek dan tajuk projek															
Membuat penyelidikan tentang projek															
Menyediakan bahan dan komponen projek															
Membuat proposal projek															
Menyiapkan projek dengan bahan yang sedia ada															
Membuat kajian di lapangan insitusi PSA															
Menyediakan slide Pembentangan Proposal															
Pembentangan untuk pemilihan projek															

PROJECT ACTIVITY PLANNER

CARTA GANTT PROJECT 2

MINGGU	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AKTIVITI PROJEK														
Fabrikasi projek														
Membuat pengujian projek														
Mengedarkan soalan kaji selidik keberkesanan selepas projek disiapkan														
Menambah baiki projek														
Menganalisis data yang diperolehidan menghasilkan jurnal														
Membuat pendaftaran MyIPO														
Menghasilkan video projek														
Menghasikan poster dan risalahprojek														
Menyiapkan laporan akhir projek														
Pertandingan Mech Tech Jun 2021 dan penghantaran laporan FYP														

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