POLITEKNIK MALAYSIA

BANTING

DIPLOMA IN MECHANICAL ENGEENERING

DJJ40182: PROJECT 1 LEAF CLEANING MACHINE PROTOTYPE

CLASS: DKM5A

SUPERVISOR: PN. CHE FARIDAH BINTI CHE MOHAMAD

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DECLARATION OF ORIGINALITY AND

OWNERSHIP

TITLE: LEAF CLEANING MACHINE PROTOTYPE : SESSION 1 2023/2024

1. We,

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are final year student of **Diploma of Mechanical Engineering, Politeknik Banting Selangor ,**which is located at **Persiaran Ilmu , Jalan Sultan Abdul Samad, 42700 Banting Selangor Darul Ehsan.**

2. We represent that the Project and the intellectual property contained there is original work/design without taking or imitating any intellectual property from other parties.

3. We here by agree to relinquish the ownership of the intellectual property in 'Leaf Cleaning Machine Prototype' to 'Politeknik Banting' to fulfil the requirement for the award of Diploma in Mechanical Engineering to us Subscribed and solemnly declare by the above named;

a) FATHOR RAHMAN BIN FAUZAN

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b) MUHAMMAD AIZAD NAJMIE BIN JAMAL NASIR

NRIC: 040729-08-0495 (……)

c) EIKHWAN HARRIS BIN MOHAMMAD REDZWAN

NRIC: 041109-14-0711 (……)

d) MUHAMMAD HAIZAD DANIAL BIN MOHD AZAN

NRIC: 040708-10-1103 (……)

Before me, as supervisor of the project

MADAM CHE FARIDAH BINTI CHE MOHAMAD

(…….)

ABSTRACT

This project is specializes in manufacturing advanced leaf-cleaning machines designed to cater to both residential and commercial needs. These machines combine ergonomic designs with innovative features to ensure efficient and comfortable operation. Engineered for various terrains and workloads, they range from compact models ideal for small gardens to high-capacity machines suited for professional landscaping and large-scale maintenance tasks. Powered by energy-efficient systems, our machines offer exceptional cleaning performance while minimizing environmental impact. Built with durable materials and enhanced with user-friendly controls, they ensure reliability and ease of use even in demanding conditions.

We are committed to providing comprehensive customer support, including installation, maintenance, and repairs, to maximize machine performance and customer satisfaction. By integrating cutting-edge technology, ergonomic design, and a focus on sustainability, our leaf-cleaning machines deliver unmatched productivity and convenience for keeping outdoor spaces clean and debris-free.

CHAPTER 1 : INTRODUCTION

1.1 INTRODUCTION

Leaf Cleaner Machine is indeed the perfectionist's outdoor power tool for gardeners or cleaners in the yard. This machine purpose is to efficiently and effectively makes it easier to collect dry leaves that fall from trees. It's very useful when the autumn comes and no need to sweeping or vacuum and collecting up leaves. Other than that, this machine is designed and built to handle many leaves, its means that we have optimized the work.

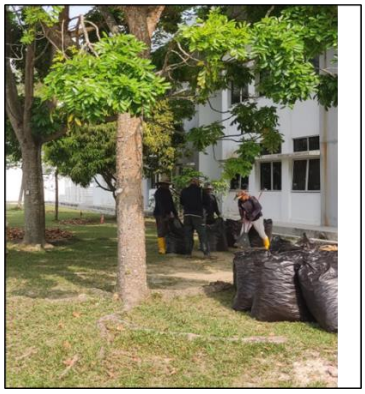
This machine is very effectively in cleaning messy leaves, so the yard will keep clean and tidy. The machine design is very convenient to perform work. This machine will provide with the backpack behind the machine to keep the leaves that have been collected from the machine stay in the bag. Additionally, the size of machine determines how much this machine can accommodate the leaves at once.

In conclusion, strength and the capacity of the machine play a significant role. A larger machine will typically have a higher capacity, allowing for larger batches of leaves to processed simultaneously. The specific will depend on the size and capabilities of the machine. Other factor can be also affect its ability to handle its effectively. Lastly, the environment will keep clean and beautiful. This machine is idea to perform work and making work easier.

1.2 BACKGROUND OF THE MACHINE & PROBLEM STATEMENT

There are various types of leaf cleaning machines on the market, one of them is a BLOWER. BLOWER is the common machines that use to clean the lawn from fallen leaves.

- The common leaf cleaning machine is very expensive
- Its also makes a loud noises that can have a bad effect on the user.
- Does not have an ergonomic design.
- Use large of electricity (certain use gasoline)



The picture above shows the method used in collecting fallen leaves. This method uses a blower that uses high wind pressure that produces a noisy sound that disturbs public order in the area involved.

1.3 0BJECTIVE

The objective of this project is :

i. **Able to operate on field.**
   - Tires can move smoothly in the field without any problems

ii. **Able to design an alternative method for collecting leaves efficiently.**
   - Reducing the workforce in one field which can cause cost production in the long run.

iii. **Able to collect leaves.**
   - Can collect leaves in large quantities which can make it easier for workers and save work time

1.4 SCOPE PROJECT

In the first place, the target audience for this project is field cleaner or anyone that works in a place that has a lot of trees. The motif of this project is made to reduce the noise to avoid disturbing the neighbours, for example leaf blowers have a loud noise so it may cause disturbance to neighbours. Other than that, it also costs less than others that currently have in the market. Also, it can be stored effortlessly in the storage after you take the leaves out of the compartment. Lastly, it has an ergonomic design that allow users to work more efficiently and longer periods without experiencing discomfort.

1.5 IMPORTANCE/BENEFITS OF PROJECT PRODUCTION

This project can be very beneficial to user. It is easy to use, an ergonomic design and economical time. In addition to being able to avoid hearing problems for users and people around them. Other than that, the importance of producing this product can benefit users in the long term.

PROPERTIES	Blower that uses gasoline	Blower that uses battery
Design		
Mode operating	Fuel	Electric
Material	Plastic	Plastic
Features	Blow dry leaves using high air pressure	Blow dry leaves using high air pressure
Safety	Low	Low
Price	RM 70.00 - RM 300.00	RM 700.00 - RM 2500.00

CHAPTER 2 : LITERATURE REVIEWS

2.1 INTRODUCTION

Kyoritsu (the first company that making blower) followed that design with a backpack/blower/misting machine in 1955. One by one new designs have been developed and it provides great benefits to users in cleaning the yard from fallen leaves. This chapter will be describe the innovation of blower includes operating mechanisms, design and manufacturing cost.

2.2 THE DESIGN OF BLOWER IN CURRENT MARKET

From our observation that has been made, we found that most blower machines use motors that make noisy noises but use different energy sources such as using gasoline and electric. The use of substances such as gasoline can cause air pollution because it emits carbon monoxide gas. Carbon monoxide poisoning can cause medical problems and death. In severel cases it can cause long-term problems and disabilities in both mental and physical areas.

The use of renewable energy such as battery can have a positive effect on the user, the surrounding people, the ecosystem and biodiversity.

2.3 RESEARCH WORK

2.3.1 Advantages of Leaf Cleaning Machine

1. Innovative Design:

The machine's design mimics that of a lawn mower, making it intuitive for users familiar with similar equipment. This can lead to quicker adoption and ease of use.

2. Lightweight Materials:

Using PVC for the blades reduces the overall weight of the machine, enhancing maneuverability. This is particularly beneficial for prolonged use in large areas, minimizing user fatigue.

3. Cleaning Brush:

The integrated brush not only clears debris from the blades but also helps prevent clogs, ensuring consistent performance. This feature increases efficiency and reduces the time spent on maintenance during operation.

4. Systematic Collection:

The central bag effectively collects leaves, allowing operators to work continuously without frequent stops to empty the collection area. This design enhances productivity, especially in large areas with heavy leaf fall.

5. Convenient Power Source:

Utilizing a motor battery allows for portability and independence from power outlets, making the machine suitable for use in remote areas or where electrical supply is limited. Battery operation also provides a cleaner alternative compared to gas-powered equipment.

6. Environmentally Friendly:

By avoiding the use of chemicals or motor oils, this machine offers a sustainable option for leaf collection. Its design can help promote eco-friendly practices among users**.**

2.3.2 Disadvantages of Leaf Cleaning Machine

1. Battery Dependence:

The reliance on a motor battery can limit the machine's operating time, requiring careful planning to ensure batteries are charged and swapped when necessary. Users may need multiple batteries for extended tasks, increasing initial costs.

2. Material Durability:

While PVC is lightweight, it may not withstand heavy impacts or harsh conditions as well as metal or reinforced plastic. Over time, exposure to UV light and weather can degrade the material, leading to potential failures.

3. Effectiveness on Different Surfaces:

The machine may struggle on uneven terrain or surfaces with large debris. In such conditions, its performance could decrease, requiring manual intervention for thorough cleaning.

4. Maintenance Costs:

Components like nails and brushes are subject to wear and may require frequent replacement. Users should factor in these costs when calculating the machine's overall expense.

5. Handling Wet Leaves:

The design may be less effective for collecting wet or sticky leaves, which can clump together and clog the machine. This limitation could reduce efficiency during rainy seasons or in certain climates.

2.4 MATERIALS SELECTION FOR LEAF CLEANIER MACHINE

The material that will be use to make this product is :

- Mild Steel hollow bar
- Wheel
- PVC pipes
- Nails
- Switch on/off
- Battery
- Motor
- Wires
- Brush
- Bearing

Mild steel hollow bar is used as a project frame because of its rust-resistant and light properties.

We decide to used battery as a power supply because it does not have an adverse effect on the ecosystem. Most machines in current market is using fuel as source of energy because more cheaper that using electric. The uses of fuel can cause air pollution and global warming due to the production of carbon monoxide gas from combustion products.

PVC pipes and nails are combined into machine blades that aim to pick up dry and fallen leaves on the ground. The brush is placed next to the blade which aims to clean the blade from the leaves that have stuck and push the leaves into the plastic waste.

Switch on/off, motor and wires are material to make an electric circuit that aims to move the blade brush for our product

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

To develop a leaf cleaning machine, the process begins with defining its objectives and target users, followed by conducting market research to identify strengths and weaknesses of existing models. Next, design specifications are established, focusing on size, power source, cleaning mechanisms, and durable materials.

An initial prototype is then created, which undergoes rigorous performance and user testing to ensure efficiency and usability. Based on feedback, the design is refined before finalizing the product for production. A marketing strategy is developed to promote the machine, and distribution channels are identified for effective sales. Finally, post-launch evaluations are conducted to gather customer feedback and assess performance, guiding future improvements. This structured methodology ensures the creation of a functional and user-friendly leaf cleaning machine**.**

3.1.1 FLOW CHART

This chapter focuses on the manufacturing process of the Leaf Cleaner machine. Flow chart below show the manufacturing process:

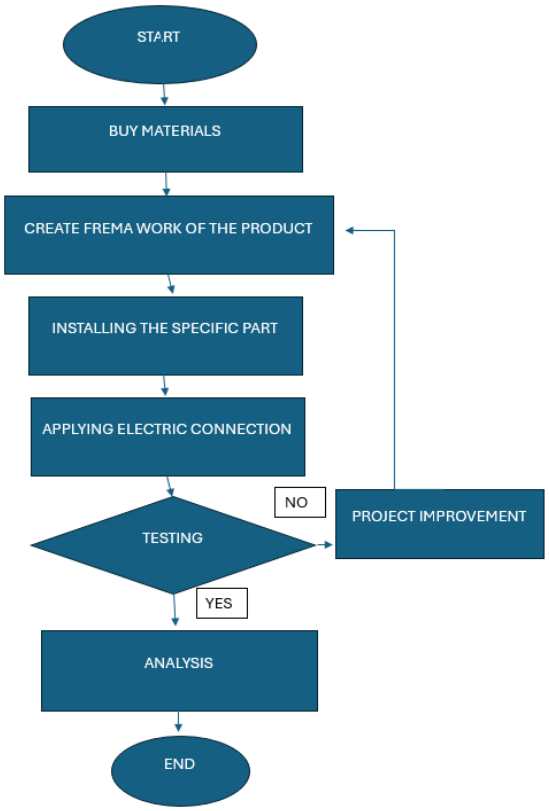


Figure 3.1: Flow Chart Project 2

3.1.2 GANTT CHART

This shows the Gantt chart in the production process of our project starting from the first one week until the 14th week. A graph in which a series of horizontal lines illustrate the quantity of work or output done in a given period of time is proportional to the amount expected for that time

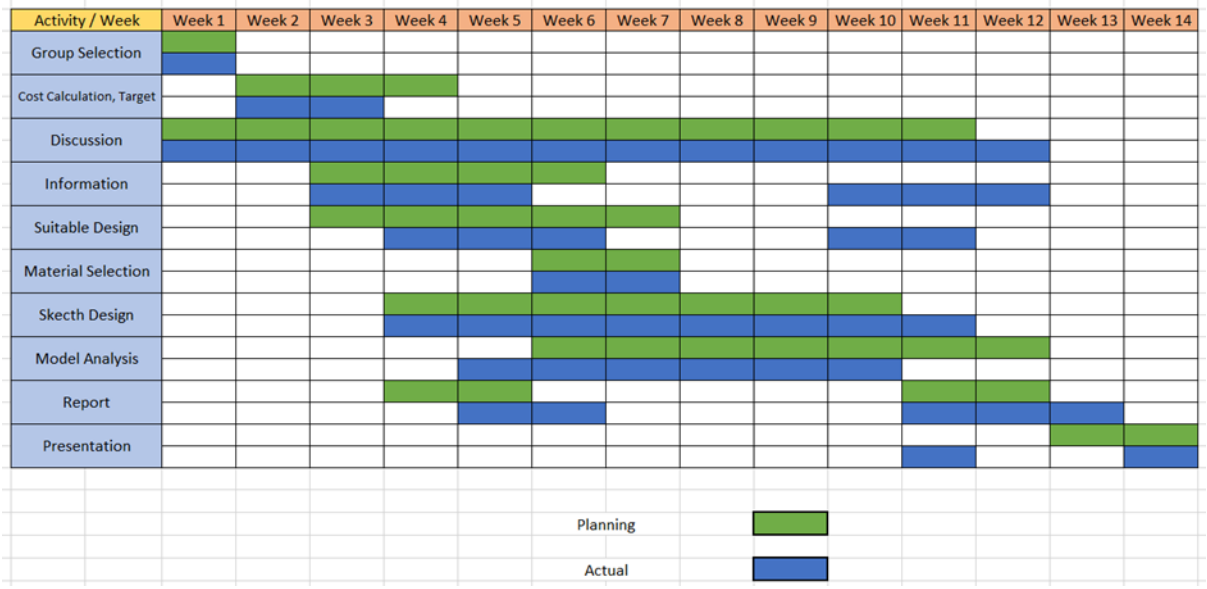


Figure 3.1: Gantt Chart Project 1

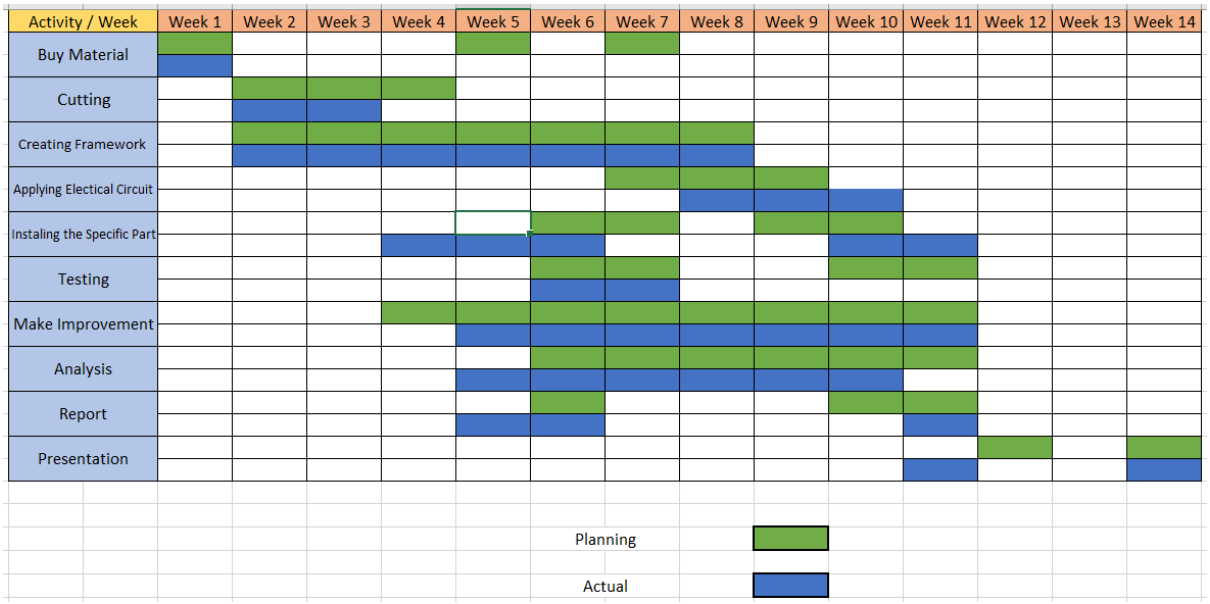


Figure 3.2: Gantt Chart Project 2

3.2 MARKET SURVEY

A market survey was conducted, and a total of 25 people responded to the questions that we asked. Market research was delivered to Polytechnic Banting Selangor students , lecturers and etc . The market study's questions are aimed towards respondents' exposure to leaf cleaning machine and their opinions on it .

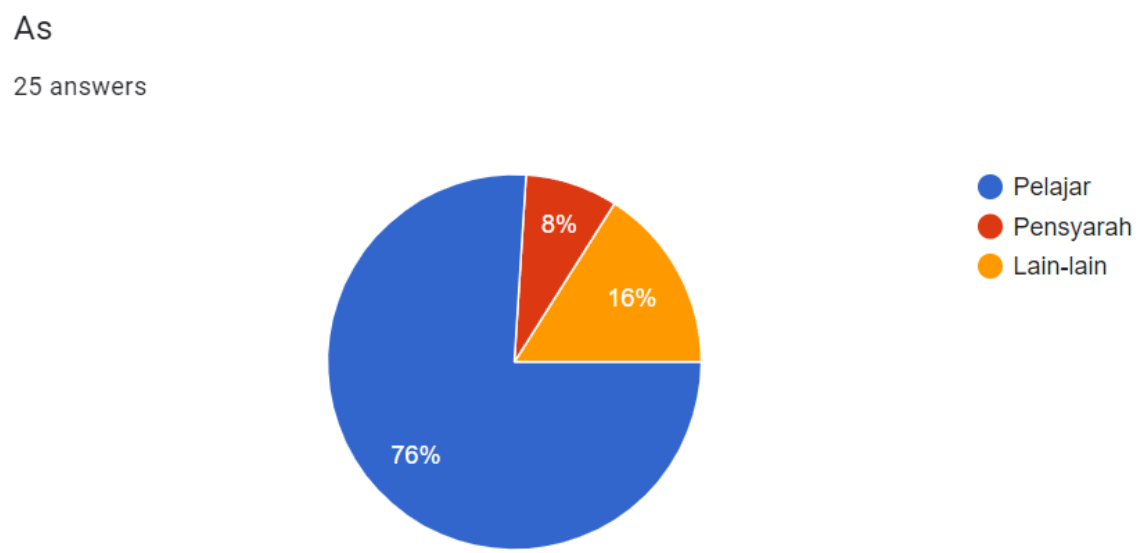


Figure 3.1 (i) the person who answers the question

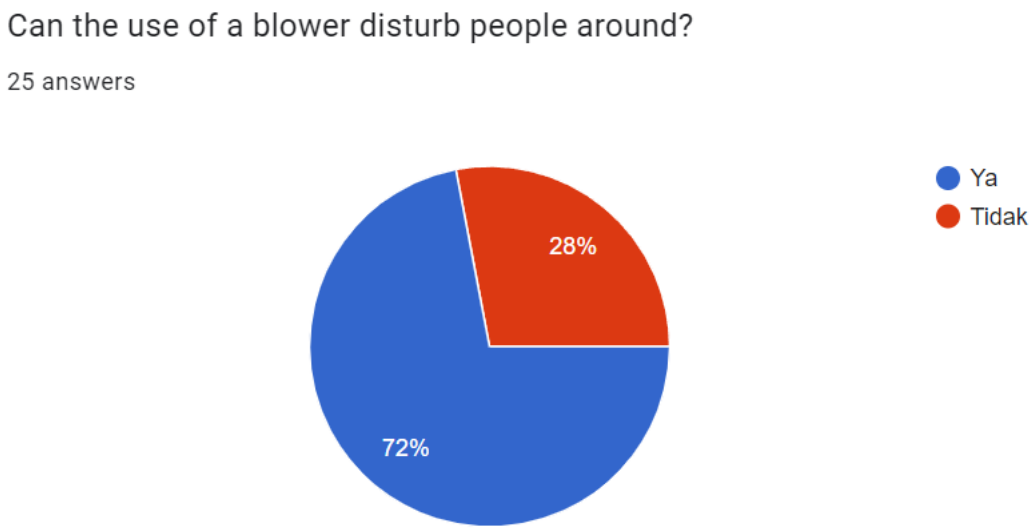


Figure 3.1 (ii) agreement about uses of blower distrurb people around

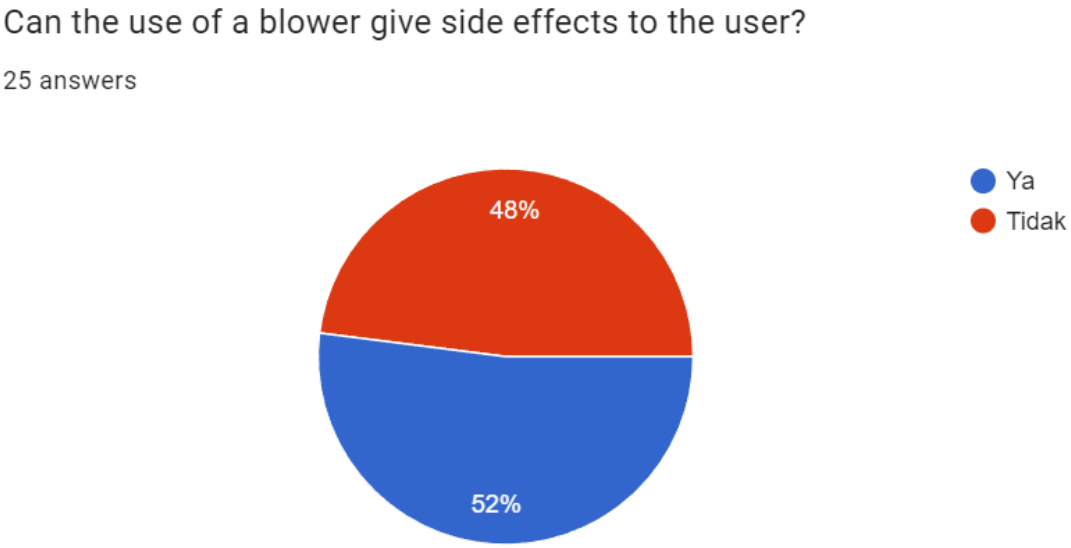


Figure 3.1 (iii) agreement about blower give a side effects to the user

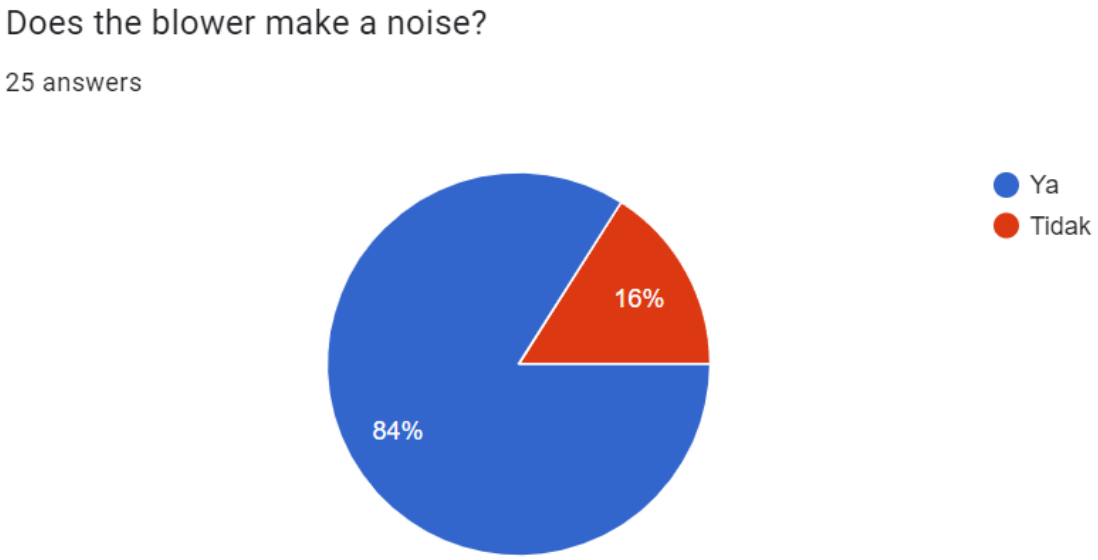


Figure 3.1 (ii) agreement about blower make a loud noises

In your opinion, the use of fuel can damage the ecosystem and affect the air quality in Malaysia?

25 answers

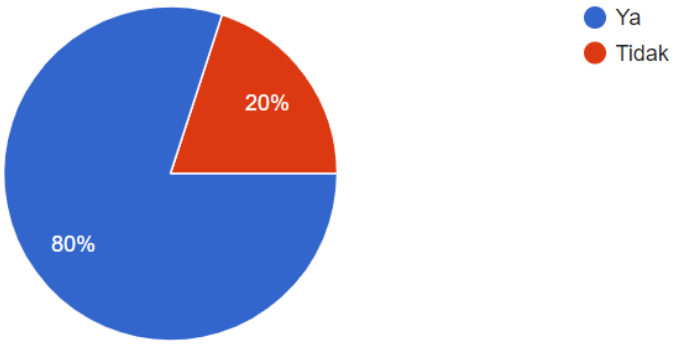


Figure 3.1 (ii) agreement about use of fuel can damage the ecosystem

3.3 CONCEPT SELECTION AND DESIGN

In first stage, we got three Leaf Cleaner Machine design idea that potentially to be process. Figure 3.1,3.2 and 3.3 shows the sketch for all three-design concept.

Figure 3.1 show the first sketch for Leaf Cleaner Machine design. The material we used for the project is mild steel hollow bar for the frame because it is low cost and durable. After that for the blade we use PVC for rotating along with the wheel using bearing, shaft rod and nails for picking the leaves. Furthermore, we use brush to sweep off the leaves that have been picked from the nail and the leaves will go into the bag that store the leaves. We use motor to spin the brush and ON/OFF button for the motor.

Figure 3.1: 1st Concept

Figure 3.2 show the second sketch that had potential to be continue it. The space to put the beg inside the frame is too small and we can't put the large sized beg inside of it. This design was not come with the front part as figure 3.1

Figure 3.2: 2nd Concept

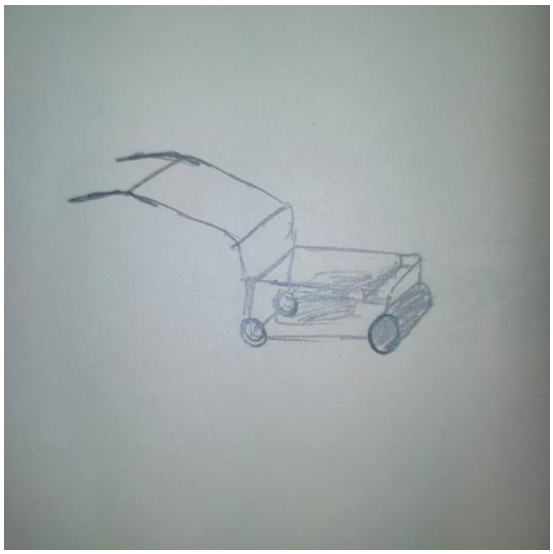


Figure 3.3 show the third sketch. This concept was designed with a full close with rectangle shaped frame. It is also ergonomic with bull-horn handle that bicyclist usually use to marathon, it is also come with arm rest to let user rest their arm while operating it.

Figure 3.3: 3rd Concept

Table 3.1: Comparison for all concept

Concept	Advantages	Disadvantages
1st Concept	a. Ergonomic b. Larger beg size c. More safety	a. Estimated cost around RM200-350
2nd Concept	a. Smaller size b. Less material usage c. Low cost	a. Uncomfortable b. No safety c. Small beg size
3rd Concept	a. More safety b. Ergonomic	a. Small beg size b. Estimated high cost

Table 3.2: Criteria for Comparing Concepts

No.	Criteria	Concept 1	Concept 2	Concept 3
1	Efficiency for collecting leaves	5	5	5
2	Cost of Material	4	5	3
3	Savings use of human energy	5	5	4
4	Mobility	5	4	4
5	Durability	5	4	4
	Total	**24**	**23**	**20**

3.4 TECHNICAL DRAWING

Figures below show the results of drawing using Autodesk Inventor with different type of drawing.

I. Assembly drawing and Bill of Material

Figure 3.4 show assembly drawing and bill of material of Leaf Cleaner Machine on dismantle mod that show each component. First item is frame using 40mm x 40mm aluminum hollow bar and using 30mm diameter aluminum hollow cylinder for handle bar with rubber grip wrapped. Second item is bearing with 10mm inner diameter and 26mm outer diameter and 8mm width to put in both wheel and blade shafts. Third part is blade using 80mm diameter and 300mm length PVC with 126 pieces of 20mm nails. Fourth, fifth and sixth part is 300mm length of stainless-steel shaft rod to connect the brush, wheel and blade to bearing. Seventh part is 70mm wheel to move the machine. Moreover, inside part of frame there is a 200mm length hook for attach the bag to store the leaves.

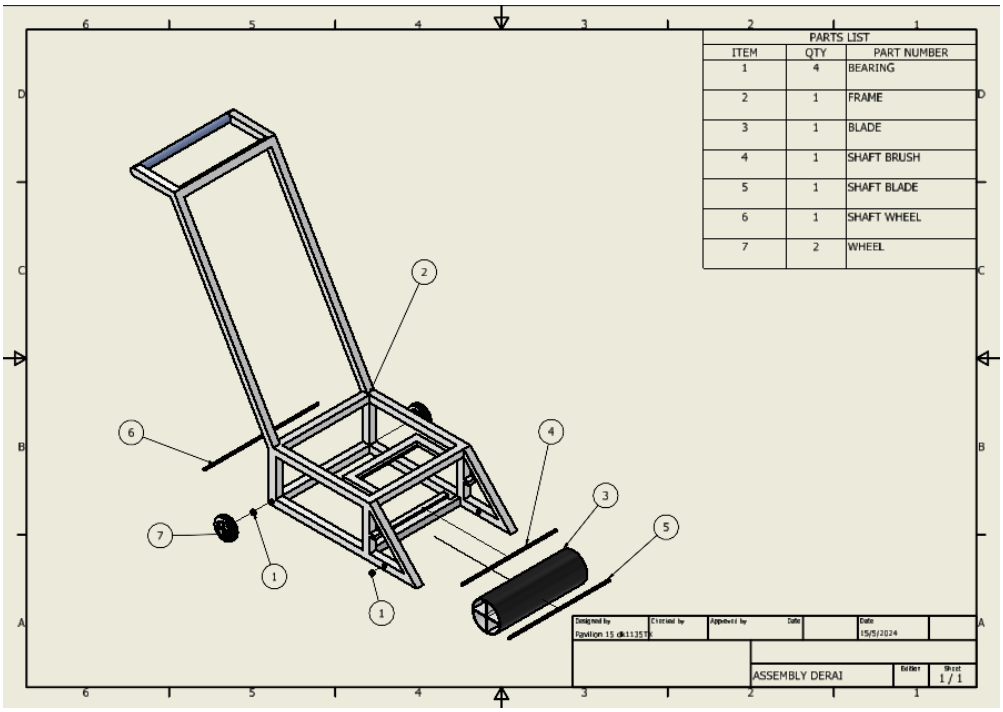


Figure 3.4: Assembly Drawing and Bill of Material

II. Isometric Drawing

Figure 3.5 show the isometric drawing of Leaf Cleaner Machine with right, top and front view along the dimension of the machine. With the top view, we can see the length of the bag hooker while for the side view, we can see the length of frame, height of frame, length of blade part frame. For the front view, we can see the wide of the machine.

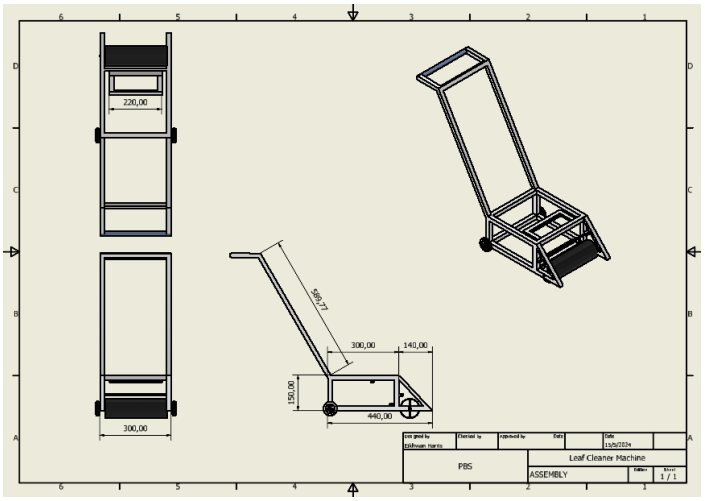


Figure 3.5: Isometric Drawing

III. Overall Project Drawing

Figure 3.6 show the overall project drawing of Leaf Cleaner Machine that has been assemble every component into one machine. First part is frame that using aluminum hollow bar with 440mm length and 300mm wide and 200mm bag hooker inside part of frame. Second part is two pieces of stainless-steel rod shaft with four pieces of 10mm inner diameter bearing to insert in the blade and 70mm wheels. Third part is blade using 80mm diameter and 300mm length PVC with nails.

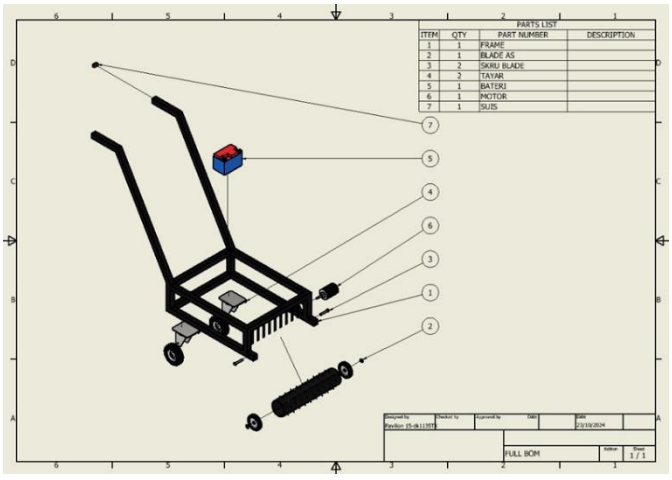


Figure3.6: Overall Project Drawing

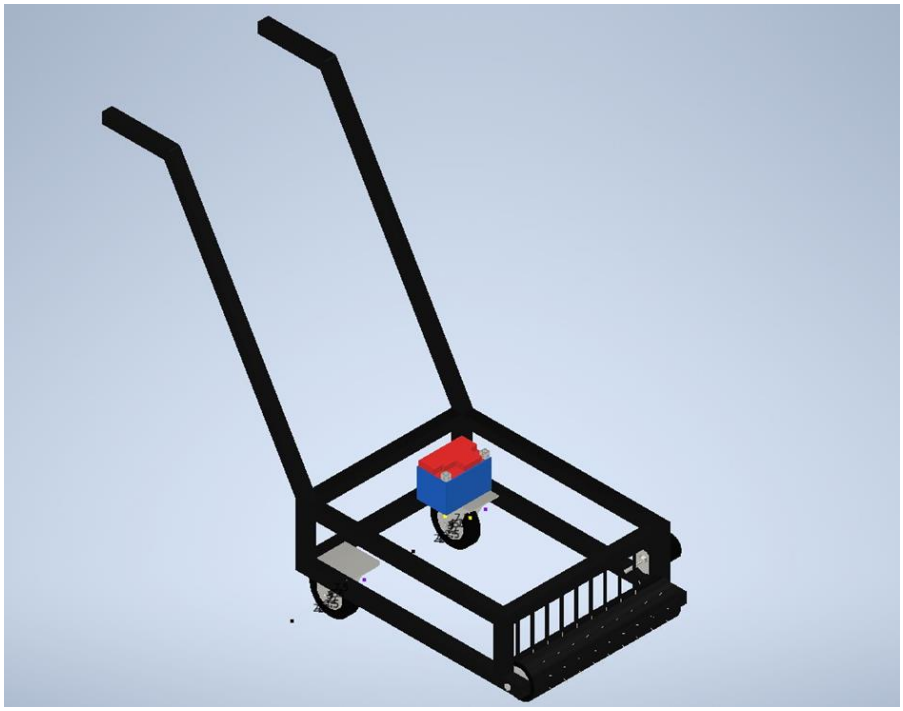


Figure3.7 : 3D Project Drawing

3.5 MATERIAL AND COMPONENT SELECTION

 Mild Steel Hollow Bar	Mild Steel Hollow Bar used for whole frame with 300mm wide, 440mm length, 150mm height and 600mm for handle length. The bar size is 40mm x 40mm
 Wheels	Two pieces of wheel to move the machine. The wheel size is 80 mm diameter.
 Wheels	Two pieces of wheel that have been connected to the blade to move the blade at the front of the machine. The wheel size is 80 mm diameter.
 PVC Pipe	PVC pipe with 80mm diameter and 300mm length used for body of blade where nails were stick on it.
 Nails	126 pieces nails is used for picking the leaves and attached to the PVC.

 ON/OFF SWITCH	Used to turn ON and turn OFF the motor.
 Motor	This motor used to spin the brush that have been connect together at the frond
 Wire tape	Wire tape used to insulate electrical wires and other materials that conduct electricity. This helps prevent short circuits, accidental shocks, and fire hazards
 Copper Brush	To sweep off the stuck leaves on blade. It is spinning with help of 1.6V motor and bearing.
 Battery	The battery is used as power supply for an electric circuit to operate the motor.
 Wires	Wires connect different components of an electrical circuit, such as switches, lights, resistors, and more, allowing them to function as a complete system

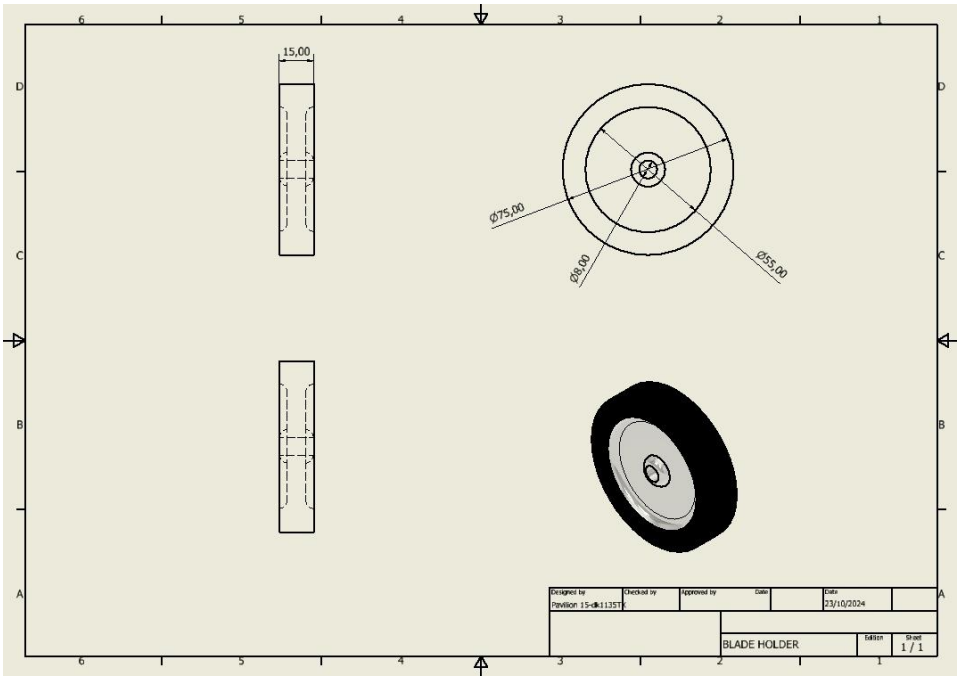


Figure 3.8 Wheel for the blade

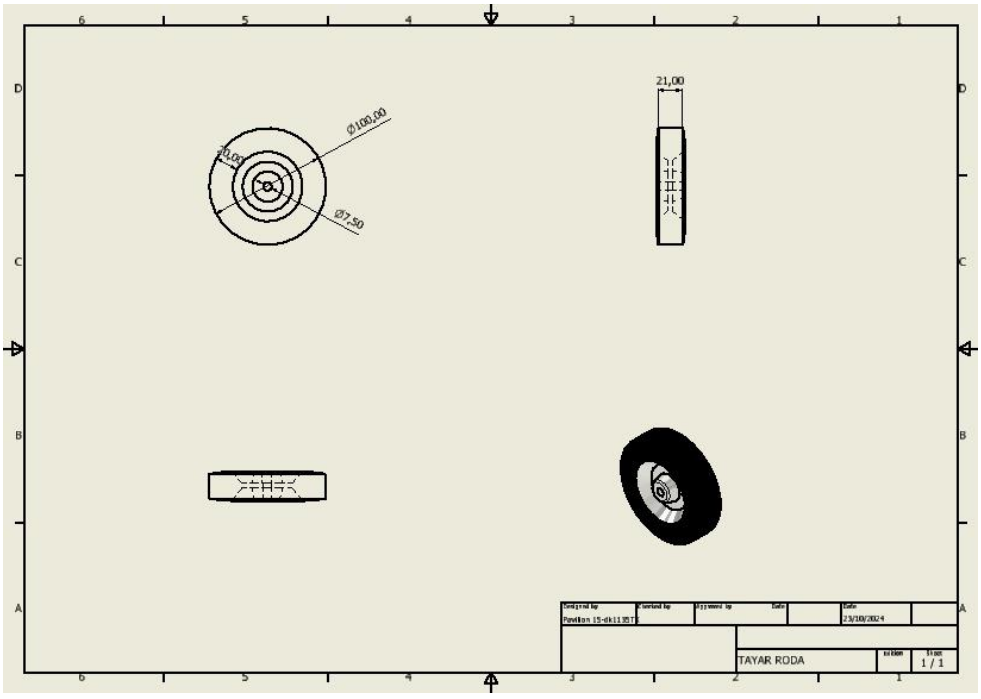


Figure 3.9 Isometric Wheels

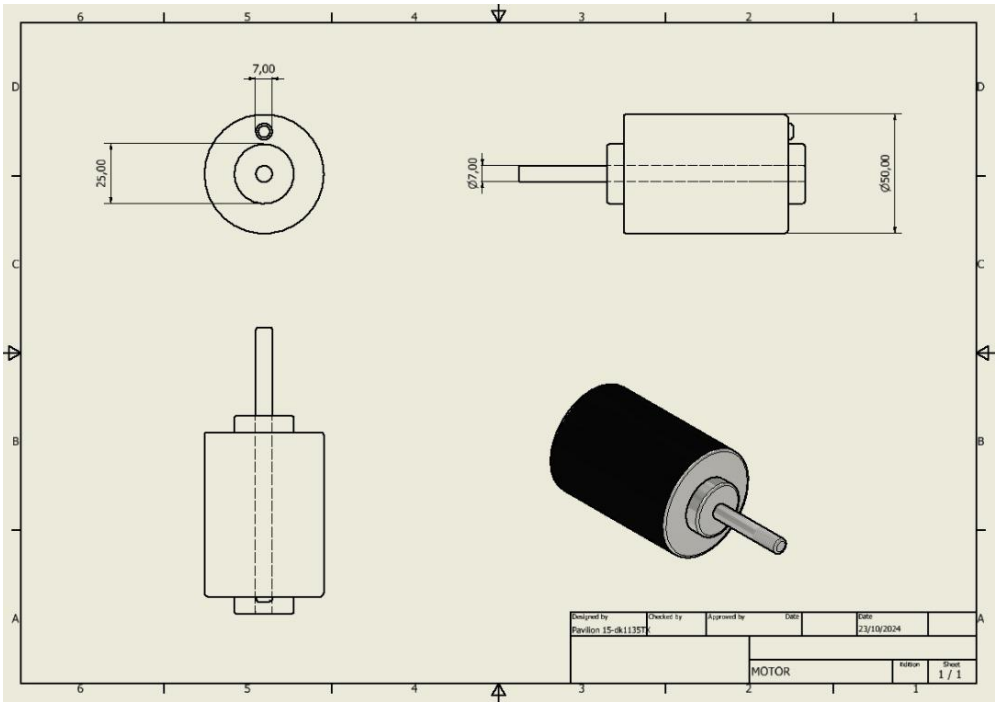


Figure 3.10 Isometric Motor

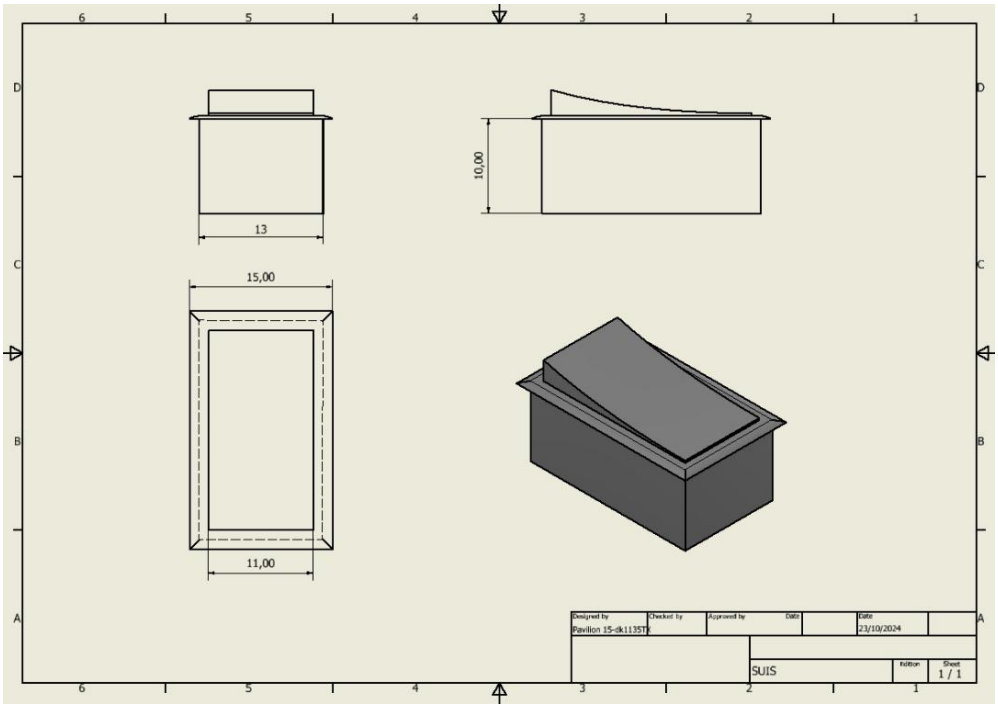
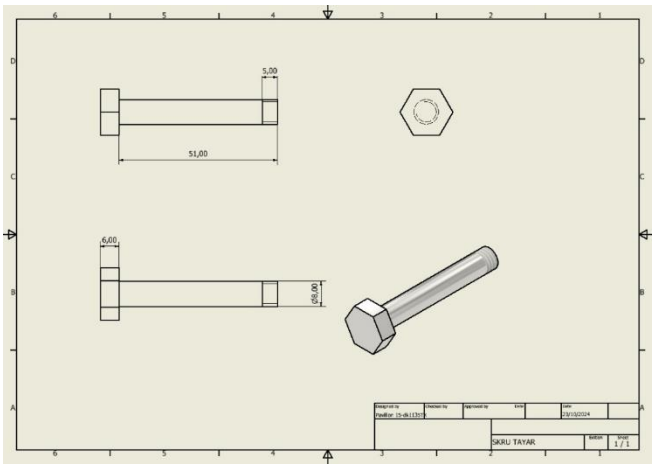


Figure 3.11 Isometric Switch



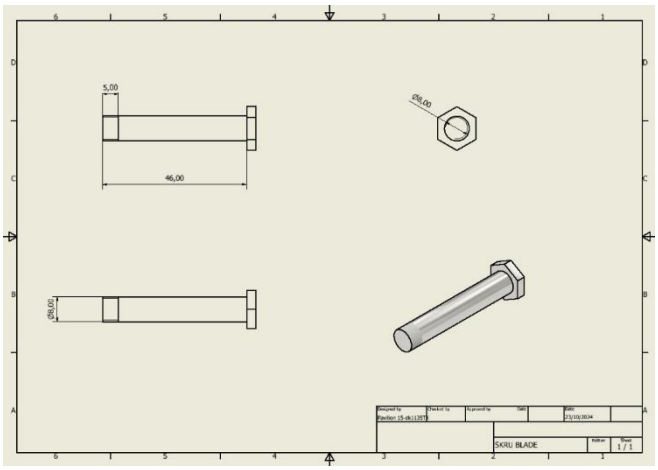
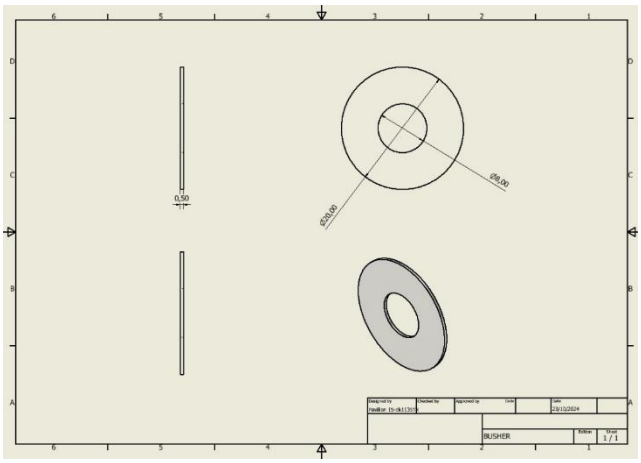


Figure 3.12 & 3.13 Isometric Screw



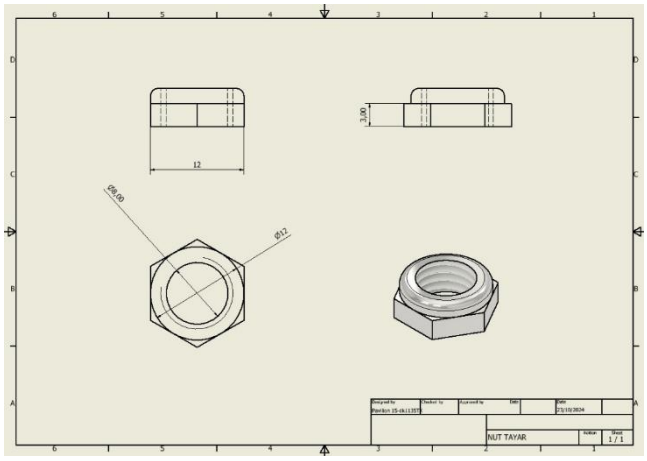


Figure 3.14 & 3.15 Isometric Washer & Nuts

CHAPTER 4 : RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter will explain about each result obtained based on the objectives set in Chapter 1. There are three objectives for this study that is able to operate on field, design an alternative method for collecting leaves efficiently, collect leaves in large quantities and also test the effectiveness of the product.

4.2 DATA ANALYSIS AND STATISTIC

In order to determine the success of the "Leaf Cleaning Machine" to all communities, we collected the statistics and data shown below from users using the Google Forms platform.

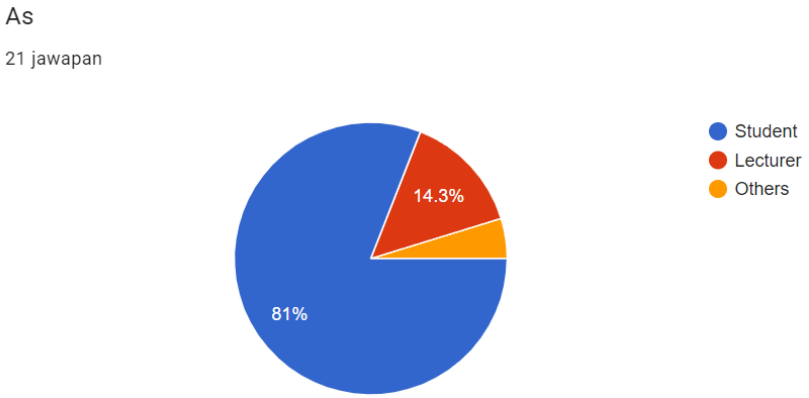


Figure 4.1 Feedback from the Google Forms

Based on the chart provided, the Leaf Cleaning Machine project has received feedback from three categories of respondents: students, lecturers, and others. Out of a total of 21 respondents, the majority of the feedback comes from students, representing 81% of the respondents. This indicates that most of the primary users or observers of the project are students, who may be directly involved in using or evaluating the machine. Lecturers provided 14.3% of the total feedback. This could reflect their role as mentors or academic observers in assessing the effectiveness of the project.The others category contributes the smallest portion, with 4.8%, which could involve staff or other individuals indirectly connected to the project.

Overall, this feedback reflects a high level of student involvement, with some contribution from lecturers and other parties in evaluating the performance of this leaf cleaning machine.

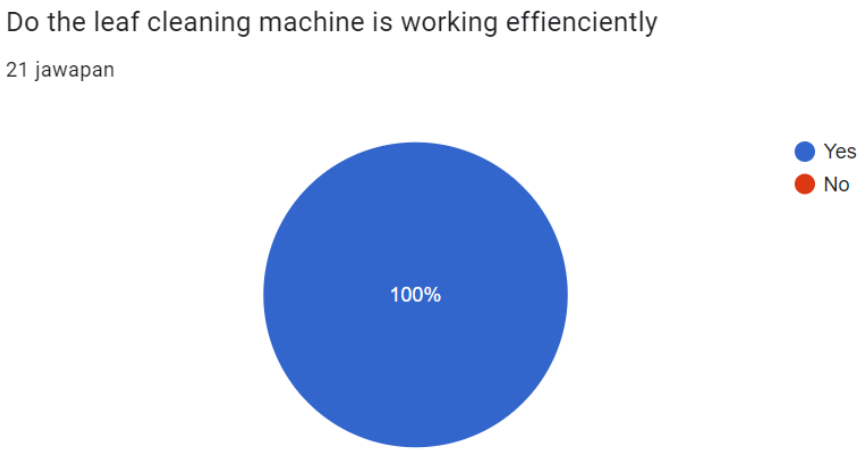


Figure 4.2 Feedback for this project working effienciently

Based on the chart provided, the Leaf Cleaning Machine project has received feedback from three categories of respondents: students, lecturers, and others. Out of a total of 21 respondents, the majority of the feedback comes from students, representing 81% of the respondents. This indicates that most of the primary users or observers of the project are students, who may be directly involved in using or evaluating the machine. Lecturers provided 14.3% of the total feedback. This could reflect their role as mentors or academic observers in assessing the effectiveness of the project. The others category contributes the smallest portion, with 4.8%, which could involve staff or other individuals indirectly connected to the project.

Overall, this feedback reflects a high level of student involvement, with some contribution from lecturers and other parties in evaluating the performance of this leaf cleaning machine.

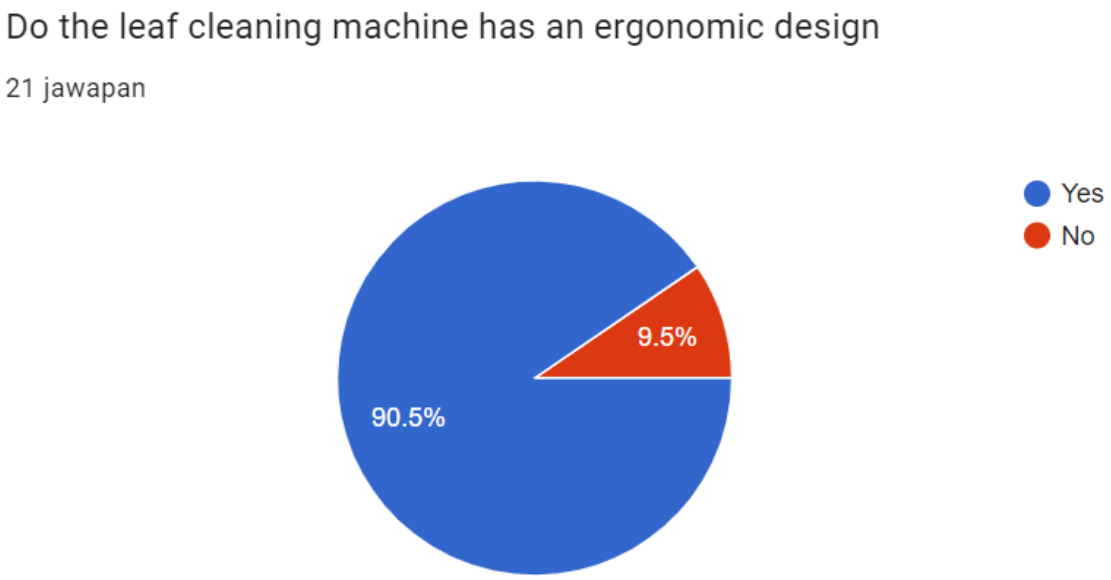


Figure 4.3 Feedback for the project has an ergonomic design

In a survey conducted among 21 respondents, including students, lecturers, and other participants, a significant majority of 90.5% expressed agreement that the design of the leaf cleaning machine is ergonomic, indicating that they find it comfortable and efficient to use. This positive response suggests that most users perceive the machine's design to support ease of handling and operation.

However, a smaller group, representing 9.5% of the respondents, disagreed, implying that they did not find the design to be ergonomically satisfactory. This feedback highlights a generally favorable perception of the machine's ergonomics, with only a small percentage expressing concerns

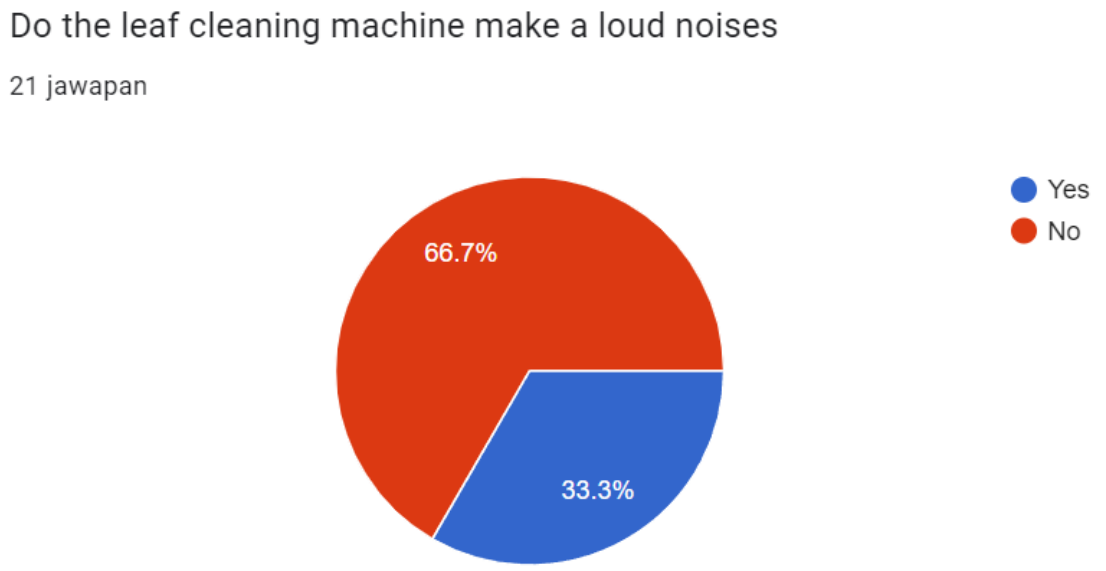


Figure 4.4 Feedback for the project make a loud noises

In a survey of 21 respondents, including students, lecturers, and others, 66.7% disagreed with the statement that the leaf cleaning machine produces excessive noise that could disturb the environment. This majority suggests that most users find the machine to operate quietly or at a noise level that is not disruptive. The results indicate that the machine's sound levels are generally acceptable in various settings, likely making it suitable for use in environments where noise control is important, such as residential or academic areas.

However, a notable 33.3% of respondents did not share this view, implying that for nearly one-third of the participants, the noise produced by the machine is a concern. This minority might have experienced the machine in different conditions or settings where the noise level was more noticeable and problematic. These differing opinions highlight the possibility that the noise level of the machine may vary depending on specific circumstances, such as the environment in which it is used, or the users' sensitivity to sound.

In summary, while the majority of users do not find the noise to be disruptive, there remains a significant proportion of individuals who believe the machine could cause environmental disturbances due to noise. This feedback may warrant further consideration for potential noise reduction improvements in future designs.

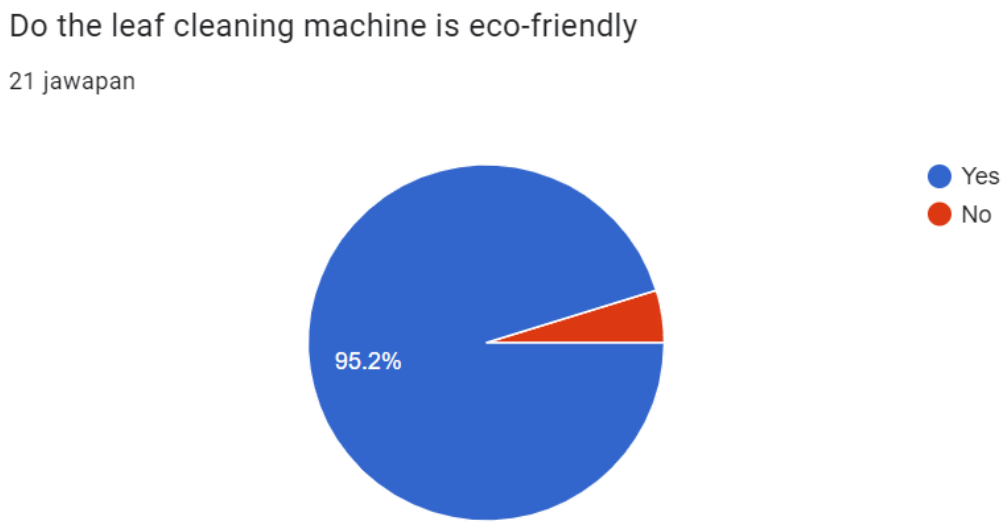


Figure 4.5 Feedback for the project is eco-friendly

In a survey involving 21 participants, including students, lecturers, and other individuals, an overwhelming 95.2% agreed that the leaf cleaning machine is eco-friendly, primarily due to its operation without gasoline. This high level of agreement highlights the growing awareness and appreciation for environmentally sustainable practices among users. The machine's reliance on battery power instead of traditional gasoline engines significantly reduces harmful emissions, aligning with the increasing demand for green technology in various applications.

The positive response from the majority indicates that users recognize the environmental benefits of using a machine that minimizes air pollution and fossil fuel consumption, which are crucial factors in combating climate change and promoting cleaner air quality.

However, the remaining 4.8% of respondents did not share this view, suggesting that there may be some concerns regarding the environmental impact of battery production and disposal, or they may have different criteria for what constitutes eco-friendliness. These differing perspectives could prompt further exploration into the machine's overall environmental footprint, including the sourcing and sustainability of the batteries used.

In conclusion, the feedback strongly supports the notion that the leaf cleaning machine is perceived as a responsible and eco-conscious alternative to gasoline-powered options. This positive sentiment not only reflects a shift towards more sustainable landscaping practices but also underscores the importance of developing environmentally friendly technologies in today's society.

4.3 PROJECT OUTCOME

This is a picture of our project that we were able to complete over the course of 14 weeks as well as our last project :

4.4 COSTING ANALYSIS

Cost analysis is divided into two which are purchase costs materials/components and service costs to create this Leaf Cleaning Machine Prototype. Conducting a thorough costing analysis helps stakeholders make informed decisions regarding the pricing, profitability, and overall viability of the leaf cleaning machine in the market.

4.4.1 MATERIAL AND COMPENENT COST

Table 4.5 lists the cost of purchasing materials to make the leaf cleaning machine.

No.	Component name	Cost per unit (RM)	Quantities	Total price (RM)	Source
1	Wheel for Blade	5	2	10	Shopee
2	Back Wheel	11.90	2	23.80	Mr. Diy
3	Battery	37.70	1	37.70	Shopee
4	Switch On /Off	6.80	1	6.80	Shopee
5	Motor	38	1	38	Shopee
6	Copper Brush	9	3	27	Shopee
7	Mild Steel	65	6 Meter	65	Huat Hin Timber & Hardware
8	Welding Rod	30	1 Kg	30	Kit Seng Hardware
9	Screw and Nuts	-	2 Set	3	Upseng Hardware
10	Drill Blade	20	1	20	Kit Seng Hardware
11	Sack	2	1	2	Upseng Hardware
12	Glue	3	1 Pack	3	Mr.Diy
13	Spray Paint	10.90	2	21.80	Mr.Diy
14	Measurament Tape	19	1	19	Mr.Diy
15	Wiring Tape	5	2	10	Mr.Diy
16	Nails	5	1 Set	5	Kim Seng Hardware
Total Cost			**RM 322.10**		

4.4.2 SERVICE COST

Since we are buying iron that is 6 m long and has a weight of 20 kg, we need a delivery service by a store that has suitable transport to deliver the iron**.**

No.	Proses Name	Cost per service (RM)	Number of Service	Total Price (RM)	Source
1	Delivery for Steel	10	2	20	Huat Hin Timber & Hardware
2	Delivery Collecting Service	1	5	5	Co-op Politeknik Banting
3	Delivery Online Service	5	6	30	Shopee Delivery
4	Sewing Service	5	1	5	Kedai Jahit Si Boy Repair Alteration
			Total	**RM 60**	

4.5 PROJECT TESTING AND PERFORMANCE ANALYSIS

FIRST ATTEMPT	
Concept	The concept of using a blade to pick up fallen leaves and a motor with a plastic brush to clean the blade from dry leaves
Weight	Light
Material	Aluminium
Durabilty	Low
Percentage of leaves that can be collected	10%

SECOND ATTEMPT	
Concept	The concept of using a blade to pick up fallen leaves and a motor with a copper brush and hook at the top of blade that can make the brush to clean the blade easier
Weight	Moderate
Material	Mild Steel
Durabilty	High
Percentage of leaves that can be collected	80%

4.6 DISCUSION

The leaf collecting machine designed shares a similar concept with grass-cutting machines, integrating innovative features to enhance its functionality and efficiency. The blades, constructed from PVC, are designed with strategically placed holes for nails, which serve as to pierce the leaves from the ground as the machine is pushed forward. This design allows for easy collection of leaves while minimizing damage to the underlying soil.

Additionally, the incorporation of brushes along the blades plays a crucial role in clearing away dry leaves, effectively directing them into a collection bag attached at the center of the machine. This bag facilitates the gathering of leaves, making disposal convenient and efficient. Powered by a motor battery, the machine operates quietly and eco-friendly, eliminating the environmental concerns associated with gasoline-powered alternatives. Overall, this machine combines practicality with sustainability, offering an effective solution for leaf collection while promoting environmentally conscious practices.

CHAPTER 5 : CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In this chapter, we will discuss the accomplishments of the goals and objectives outlined in the study "LEAF CLEANING MACHINE PROTOTYPE".
Additionally, we will provide suggestions and recommendations aimed at enhancing the product's efficiency to attract a wider consumer base and promote its purchase

5.2 ACHIEVEMENT OF AIMS AND OBJECTIVE OF RESEARCH

With all the research and information gathering now we can conclude that the goal and the objectives presented at the beginning of the research were successfully achieved. Purpose from the creation of this Leaf Cleaning Machine Prototype has shown satisfactory performance.

1. Objective: Develop a Leaf Cleaning Machine Prototype for efficient plantation.

• Conduct a comprehensive study on the leaf cleaning process, including soil conditions, leaf collect techniques, and spacing requirements.

• Analyze existing manual dry leaf collection methods and identify areas for improvement in terms of efficiency and accuracy.

• Design and prototype a mechanical blade specifically adapted for dry leaves, taking into account factors such as how many leaves can be collected, the distance between the blade points and machine operation.

• Conduct field trials to assess the performance of the machine,comparing it with manual methods.

• Evaluate the efficiency and accuracy of the blade by measuring factors such as blade rotating speed, spacing consistency, and survival rates of the blade to collect the dry leaf.

• Refine the design based on feedback and optimize the blade for commercial production.

5.3 SUGGESTIONS AND RECOMMENDATIONS

Based on the research conducted on the mechanical pineapple sapling planter, here are some suggestions and recommendations to further improve its efficiency and attract more consumers:

1. The use of PVC for the blades is innovative, exploring more durable materials like reinforced plastic or lightweight metals, such as aluminum, could enhance the machine's durability and efficiency.
2. Incorporating an adjustable blade height feature would increase the machine's versatility, allowing it to perform better on uneven terrains or with varying amounts of leaves.
3. Battery efficiency is another area worth optimizing. Switching to a more powerful and long-lasting battery, such as a lithium-ion battery, would extend the machine's operating time and reduce the need for frequent recharging, making it more convenient for users.
4. Ergonomically designed handles and adjustable for any types also a lightweight frame could further enhance user comfort, making the machine easier to push for extended periods.
5. Simple safety mechanism, like an automatic shut-off when the machine is tilted or not in use, would increase safety and give users more confidence in operating the device.

5.4 CONCLUSION

Choosing the leaf cleaning machine prototype depends on your specific needs, such as yard size, yard condition and power options. For large yards or large amounts of leaves, this model offers superior performance and durability, but it can cause a lot of manpower consumption. If you prefer an eco-friendly and quiet option, this model provides consistent power, even with limited range due to battery limitations. Battery-powered machines, on the other hand, provide freedom of movement but may require additional batteries for long-term use.

In addition, the garbage container can be used repeatedly because the garbage bag can be reused. This can reduce costs, save time and effort for disposal or composting. The ease of use of the machine, whether through the design or the size of the large collection bag also plays an important role in long-term satisfaction.

Finally, your choice should match the size of your yard, personal preferences (such as noise level and maintenance effort), as well as specific tasks. Investing in this quality, versatile leaf cleaner that fits your lifestyle will make yard work easier and more efficient, keeping lawns clean and tidy all year round.

5.5 REFERENCES

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