



BIRD DROPPING CLEANING MACHINE

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PERPUSTAKAAN POLITEKNIK MUKAH

CONFIRMATION OF PROJECT REPORT

Project report entitled “ Bird Dropping Cleaning Machine” was submitted and reviewed way as to meet the condition and requirements of writing project as required

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ABSTRAK

Tujuan projek ini dijalankan untuk membina sebuah mesin pembersih najis burung untuk kegunaan pekerja am di Politeknik Mukah. Najis burung merupakan sisa pembuangan dan sangat membahayakan terhadap manusia kerana najis burung terdapat toxin dan virus yang boleh membawa penyakit kepada manusia. Mesin ini dicipta dengan menggunakan bahan terbiar atau tergendala seperti mesin grinder. Penginjal disambung pada tangki air dan bahan kimia untuk mengawal kadar alir. Dapatan kami adalah mesin ini mampu membersihkan najis burung dengan 66.3% lebih laju dan keputusannya adalah memuaskan iaitu 70%-80% bersih berbanding dengan cara manual. Berdasarkan dapatan kami, mesin ini menunjukkan keputusan yang lebih baik dan menjimatkan masa dan tenaga manusia.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Machines have always been an object of fascination in our society. They have been used many years to complete human tasks. Life is filled with many repetitive tasks, and if machines are able to perform those tasks, they can help to ease an overarching burden. With that said, machine are optimal replacements for humans in working environment.

There is a lot of purpose for us to create this machine. It is to help general worker to clean the bird dropping rather than using manual method that is by using broom and detergent. Besides it's also ease them because it is portable and not that heavy for some people.

1.1 Problem Statement

There are a lot of bird dropping marks at 3rd floor of Mechanical Department. The bird dropping is at floor and create an unpleasant view to people who pass by. Besides the worker take more time to wash off the bird dropping marks by using manual method which using broom and detergent.

1.2 Objectives

The objectives for this project are:

- i) To produce a bird dropping cleaning machine
- ii) Reduce time of cleaning bird dropping compare to using manual method
- iii) To use materials from wasted materials

1.3 Scope

1.3.1 Specification of machine

Material	: Angle steel bar & square
Dimension	: 79cm x 40cm x 100cm
Cleaning position	: Restricted to horizontal position
Power consumption	: 220V, 50Hz , 10000rpm , 370 Watt
Max hours usage	: 10 – 12 minutes
Water tank capacity	: 7.57 L
Flow rate	: 1.966 ml/s
Disc pad	: Disc pad for tile

1.3.2 Details of testing

Testing area	: 1x 1 sqft
Chemical	: Detergent (NaOCl)

The material that we going to use for this project are grinder, steel metal, water tank and wheels. While the dimension would be 79 cm x 40 cm x 100 cm (L x B x H).

Testing for Bird Dropping Cleaning Machine will be conducted in 3rd floor of Mechanical Department, Polytechnic Mukah. This Bird Dropping Cleaning Machine has a cleaning effect better than using manual method. The testing area will be conducted at 3rd floor of Mechanical Department. The cleaning machine only limited to floor cleaning horizontally. The size of the disc pad is 100mm and the type that we used is soft type (tile grinding disc). As the volume of tank is 1 gallon (3.785L).

. 1.4 Importance Of The Project

This project would give a big effect on a system to clean the bird dropping rather than using manual method using broom with detergent. As we know using manual method consume more mankind energy and time. Besides, the bird dropping had stayed at the ground for long time and very hard to get rid of.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

A literature review is an evaluative report of information found in the literature related to your selected area of study. The review should describe summarize, evaluate, and clarify this literature. The literature review must be defined by guiding concept, example research objective, the problem or issue you are discussing or argumentative thesis. The purpose of literature review are to provide a context for the research, justify the researches , ensure the research hasn't been done before or if it is repeated, that is marked as a "replication study". The source of the review are extracted from journal, article, books, and source from website in the internet which are related to this project. This literature review is done to provide information about previous research and the relevant that can help to smoothly run this project. In our research, we have done searched about grinder, type of grinder, grinding disc pad, pneumatic connector, valve, water tank, and volume of flow rate.

2.1 Grinder



Figure 2.1.1 Hand grinder

A grinding machine, often shortened to grinder, which is any of various power tools or machine tools. This grinder is using abrasive wheel as the cutting tool. Grinding is used to finish work pieces that must show high surface quality, for example low surface roughness and high accuracy of shape and dimension. As the accuracy in dimensions in grinding is of the order of 0.000025 mm , in most applications it tends to be finishing operations and removes comparatively little metal, about 0.25 to 0.50 mm depth.

2.1.1 Types of grinder

There are nine types of grinder, which are belt grinder, bench grinder, cylindrical grinder, surface grinder, tool and cutter grinder, jig grinder, gear grinder, die grinder, and angle grinder.

2.1.1.1 Belt grinder

Usually used as a machining method to process metals and other materials. This machine from analogous to a belt sander. Belt grinding is a versatile process

suitable for all kind of applications, including finishing, debarring, and stock removal.

2.1.1.2 Bench grinder

Usually has two wheels of different grain sizes for roughing and finishing operations and is secured to workbench or floor stand. Its uses include shaping tool bits or various tools that need to be made or repaired. Bench grinder are manually operated.

2.1.1.3 Cylindrical grinder

The cylindrical grinder is a type of grinding machine used to shape the outside of an object. The cylindrical grinder can work on a variety of shapes, however the object must have a central axis of rotation. This includes but is not limited to such shapes as a cylinder, an ellipse, a cam or crankshaft.

2.1.1.4 Surfaces grinder

Has a head that is lowered to a work piece, which is moved back and forth under the grinding wheel on a table that typically has a controllable permanent magnet (magnet chuck) for use with magnetic stock especially ferrous stock but can have a vacuum chuck or other fix Turing means. This type of machine removes large amounts of material and grinds flat surfaces with noted spiral grind marks. Surface grinders can be manually operated or have CNC controls.

2.1.1.5 Tool and cutter grinder

Usually can perform the mirror function of the drill bit grinder, or other specialist tool room grinding operations.

2.1.1.6 Jig grinder

Has variety of uses when finishing jigs, dies, and fixtures. Its primary function is the realm of grinding holes for drill bushings and grinding pins. It can also be used for complex surface grinding to finish started on a mill.

2.1.1.7 Gear grinder

Gear grinder is usually employed as the final machining process when manufacturing a high precision gear. The primary function of these machine is to remove the remaining few thousandths of an inch of material left.

2.1.1.8 Die grinder

Die grinder is a high speed hand- held rotary tool with a small diameter grinding bit. They are typically air driven by using compressed air, but can be driven with a small electric motor directly or via a flexible shaft.

2.1.1.9 Angle grinder

An angle grinder also known as a side grinder or disc grinder. The grinder is a handheld power tool used for grinding, abrasive cutting, and polishing. Angle grinders are standard equipment that used in metal fabrication shops and on construction.

2.2 Grinding Disc Pad



Figure 2.2.1 Grinder Disc Pad

A grinding disk pad is a wheel composed of an abrasive compound and used for various use such grinding , abrasive cutting and abrasive machining operations.

The disk are generally made from a composite material consisting of coarse-particle aggregate pressed and bonded together by a cementing matrix (called the *bond* in grinding wheel terminology) to form a solid, circular shape. Various profiles and cross sections are available depending on the intended usage for the wheel. They may also be made from a solid steel or aluminum disc, fabric, hard polisher brush with particles bonded to the surface. Today most grinding wheels are artificial composites made with artificial aggregates.

The manufacture of these wheels is a precise and tightly controlled process, due not only to the inherent safety risks of a spinning disc, but also the composition and uniformity required to prevent that disc from exploding due to the high stresses produced from rotation.

Grinding wheels are consumables, although the life span can vary widely depending on the use case, from less than a day to many years. As the wheel cuts, it periodically releases individual grains of abrasive, typically because they grow dull and the increased drag pulls them out of the bond. Fresh grains are exposed in this wear process, which begin the next cycle. The rate of wear in this process is usually very predictable for a given application, and is necessary for good performance.

2.3 Pneumatic connector



Figure 2.3.1 Valve connector

A pneumatic connector between a hoist and a hoist pendant is provided with tapered holes and ferrules to progressively compress and retain interconnecting pneumatic tubing and further provides for assembly of a protective sheath. The connector further provides limited free rotation and a quick disconnect face seal accomplished by a single rotating threaded sleeve.

Valve is simply a freely hinged flap which drops to obstruct fluid, which are gas or liquid flow in one direction, but is pushed open by flow in the opposite direction. Valve have many uses, including controlling water for irrigation.

2.4 Valve

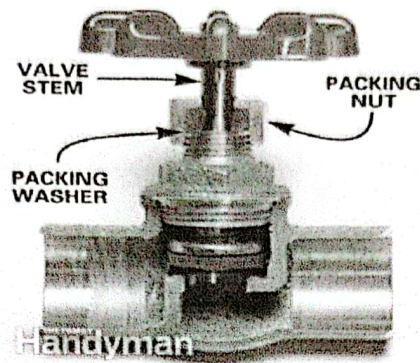


Figure 2.4.1 Controller Valve

Valve is a device that regulates, directs or controls the flow of a fluid by opening, closing, or partially obstructing various passageways of the fluid. Fluid flows in a direction from higher pressure to lower pressure.

Valves have many uses, including controlling water for irrigation, industrial uses for controlling processes, residential uses such as on / off and pressure control to dish and clothes washers and taps in the home and either other things that uses its mechanism.

2.4.1 Material used in valve

Metallic materials (for the valve body and material components, such as the stem, ball, and disc)	Non – metal materials (for packing, gasket, and seat)
1) Iron based	1) Rubber based -EPDM(Ethylene propylene rubber)

<p>-Carbon steel and cast iron (an alloy consisting mainly of iron and carbon)</p> <p>- Alloy steel (A steel to which one or more alloying elements, other than carbon, (example Ni, Cr, MN, W, and Mo) have been deliberately added to achieve a particular physical property.</p> <p>2) Non – ferrous</p> <p>-Copper alloy(bronze, brass)</p> <p>-light alloy(any one of various metal alloys consisting mainly of aluminum (Al), magnesium(Mg) to which one or more alloying element have deliberately been added(example Cu, Zn, Si)</p>	<p>-NBR (Acrylonitrile- butadiene rubber)</p> <p>-FKM (Fluor elastomer)</p> <p>2) Plastic based</p> <p>-PTFE (Polytetrafluoroethylene)</p> <p>-PA(Polyamide resin)</p>
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2.5 Water tank

Water tank is a place for storing water. Where water tank provide a storage of water for use in many applications such as drinking water, agriculture, fire suppression, and farming either both for plants and livestock, as well as many other uses. Water tank design depends on the tank uses such as the construction materials, linings. Various materials are used for making a water tank such as plastic(polyethylene, polypropylene), fibreglass, concrete, stone, steel, (welded or bolted, carbon, or stainless). Water tanks also are the most efficient ways and method to store clean water and other liquid.

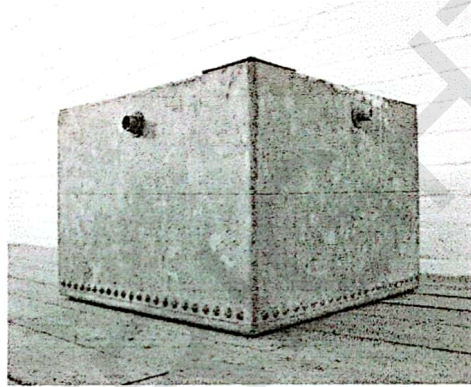


Figure 2.5.1 Water Tank

2.5.1 Volume flow rate

The volume flow rate Q of a fluid is defined to be the volume of fluid that passing through a given cross sectional area per unit time. The term cross sectional area is just a term often used to describe the area through which something is flowing. Since the volume flow rate measure the amount of volume that passes through an area per time, the equation for the volume flow rate is like as below:

$$Q = \frac{V}{t} = \frac{\text{Volume}}{\text{Time}}$$

In S.I units (International System of Unit), volume flow rate has units of meter cubed per second, m^3/s . since the number of cubic meter of fluid that flow per second.

It turns out there's a useful alternative to writing the volume rate as $Q = \frac{V}{t}$.

The volume of a portion of the fluid in a pipe can be written as $V = Ad$, where,

A = cross sectional area of the fluid

d = the width of that portion of fluid

So, substitute the formula into $Q = \frac{V}{t}$,

$$Q = \frac{V}{t} = \frac{Ad}{t} = A \frac{d}{t}$$

But the term $\frac{d}{t}$ is just the length of the volume of the fluid divided by time it took the fluid to flow its length, which is just the speed of the fluid. So, it is replaced $\frac{d}{t}$ to v .

$$Q = Av$$

A = cross sectional area of a section pipe

v = the speed of the fluid in that section.

It turns out that most liquids are nearly incompressible. This is because any portion of liquid flowing through a pipe could change shape, but it must maintain the same volume. This is true even if the pipe changes diameter. As the liquids enter the narrow section of pipe, but it maintains the same volume since liquids are incompressible. We can state mathematically that the volume flow rate is the same at two points by writing

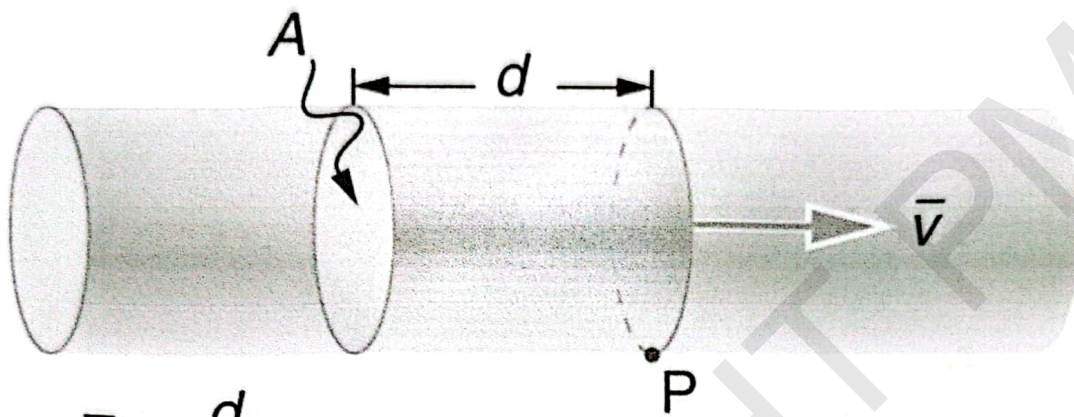
$$Q_1 = Q_2, \text{ substitute } Q = \frac{V}{t}$$

$$V_1 / t_1 = V_2 / t_2$$

Alternatively, we could plug in the alternative form of the volume flow rate, $Q = Av$, into formula $Q_1 = Q_2$, which give us,

$$A_1 v_1 = A_2 v_2$$

This equation is known as the **equation of continuity** for incompressible fluids. The previous two equations are also sometimes referred to as the equation of continuity. The equation isn't really as mysterious as the name suggests since we found it simply by requiring that volumes be incompressible as they flow through a pipe.



$$\bar{v} = \frac{d}{t}$$

$$Q = \frac{V}{t} = \frac{Ad}{t} = A\bar{v}$$

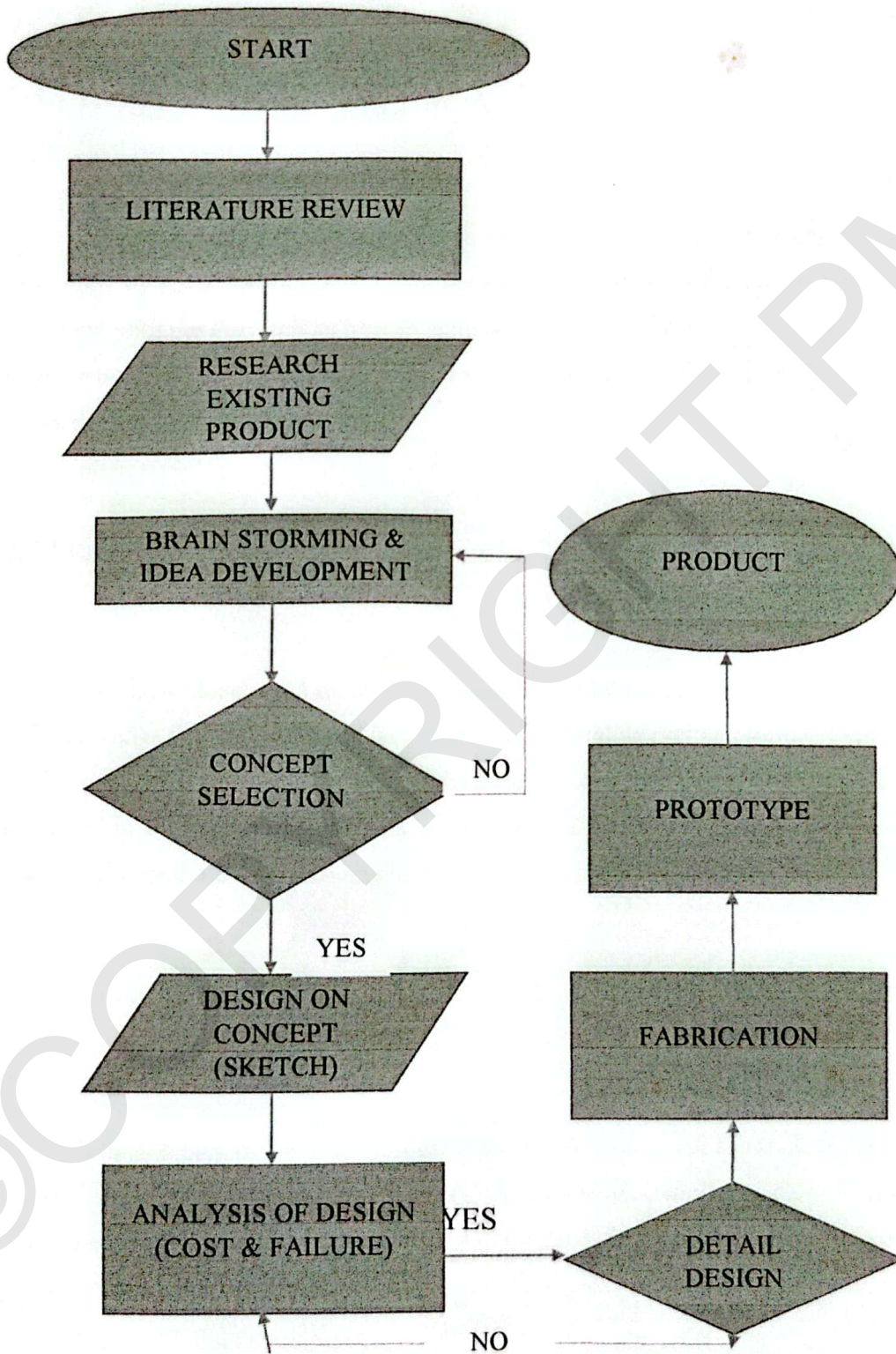
CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, we will be explains about the method of our project starting from brainstorming to the finish product. The brainstorming methods that we used are Problem , Research , Invention and Evaluation .The next stage is the fabricating process which includes of welding ,cutting ,painting ,wiring , piping and grinding process. The last method in completing this project is by covering aluminum foil on the grinder to prevent water leaks from the water tank.

3.2 Process Flow Chart



3.3 Brainstorming Method (P.R.I.M.E)

3.3.1 Problem

Problems identified through observation of the general worker cleaning the bird droppings by using broom with some detergent. We also have made a number of interview with the Polytechnic Mukah general worker and experienced lecturers in the construction of Bird Dropping Cleaning Machine For Third Floor Mechanical Department.

3.3.2 Research

We have done some research and study in the bird droppings through internet and interviews that we conducted on a number of general worker and lecturers who are experienced in bird droppings. Through the interviews, we found that there were problems in the method of cleaning by the general worker. With this, we want to improve the method, save time and human energy to clean the bird droppings.

3.3.3 Invention

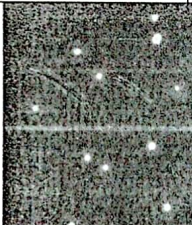
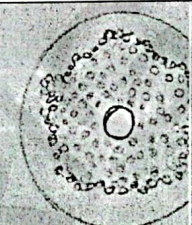
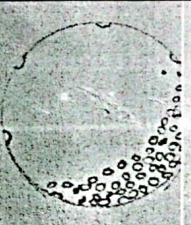
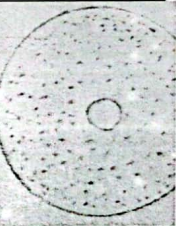
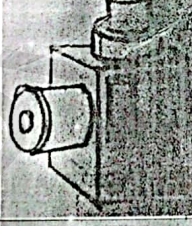

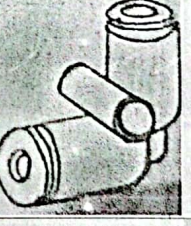
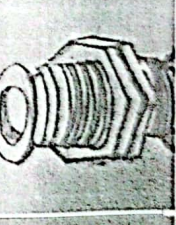

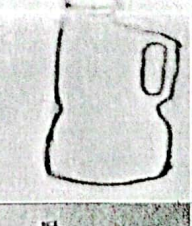
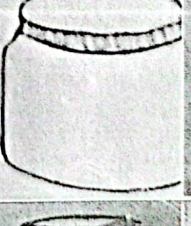
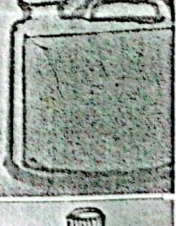
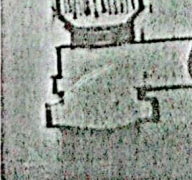


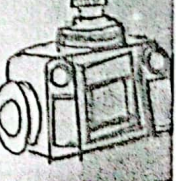
The first step of creation is through group discussion and supervisors. Next is drawing some concept or appearance of the bird droppings cleaning machine by using appropriate software such as Inventor 2014 to produce the actual design in the form of 3-dimension.


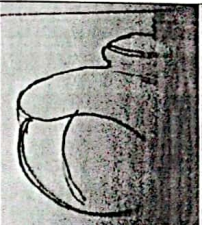
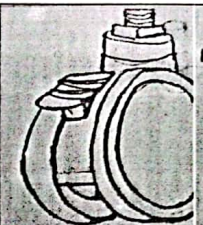
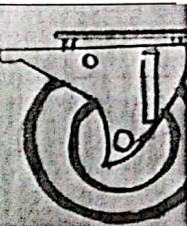

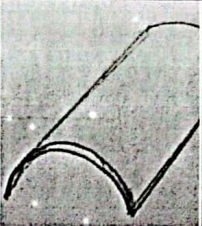
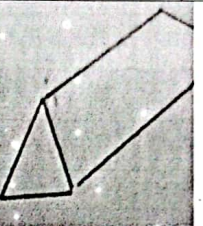
3.3.4 Evaluation

The evaluation of the project is in the terms of method selected by the general worker to clean the bird droppings. We improve the manual cleaning method which is cleaning the bird dropping by using broom and brush by creating a machine that easy to use, save human energy and time to clean the bird droppings. Beside of that, ensure that the project objectives are achieved.

3.4 Morphology Chart and Evaluation Matrix

Table 3.4 Morphology Table

	OPTION 1	OPTION 2	OPTION 3	OPTION 4
POLISHING PAD				
CONNECTOR VALVE				
WATER TANK				
CONTROLLER VALVE				

TYRE				
ALUMINIUM				

3.5 Detail design

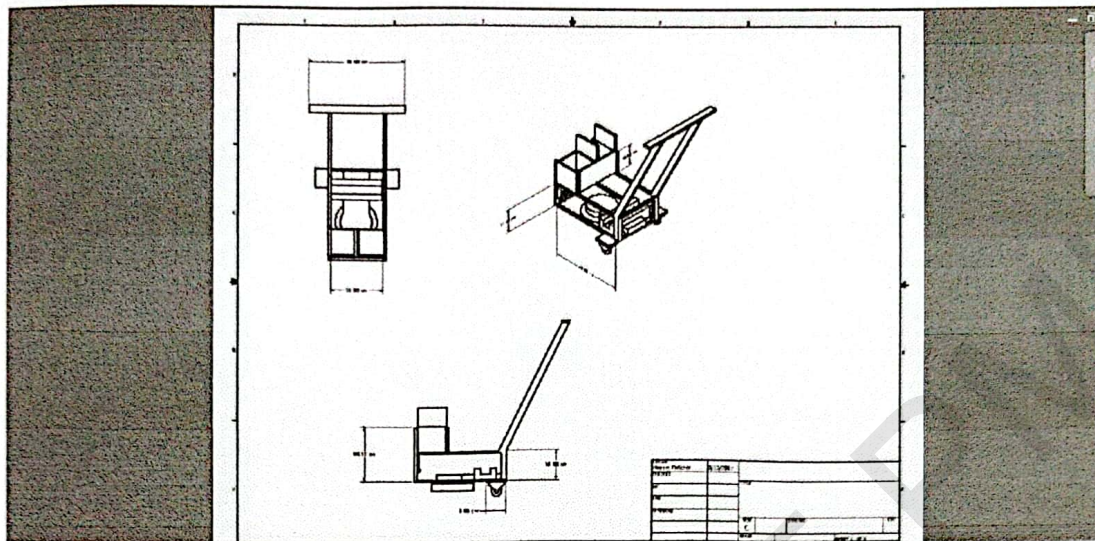


Figure 3.5.1 Isometric Drawing

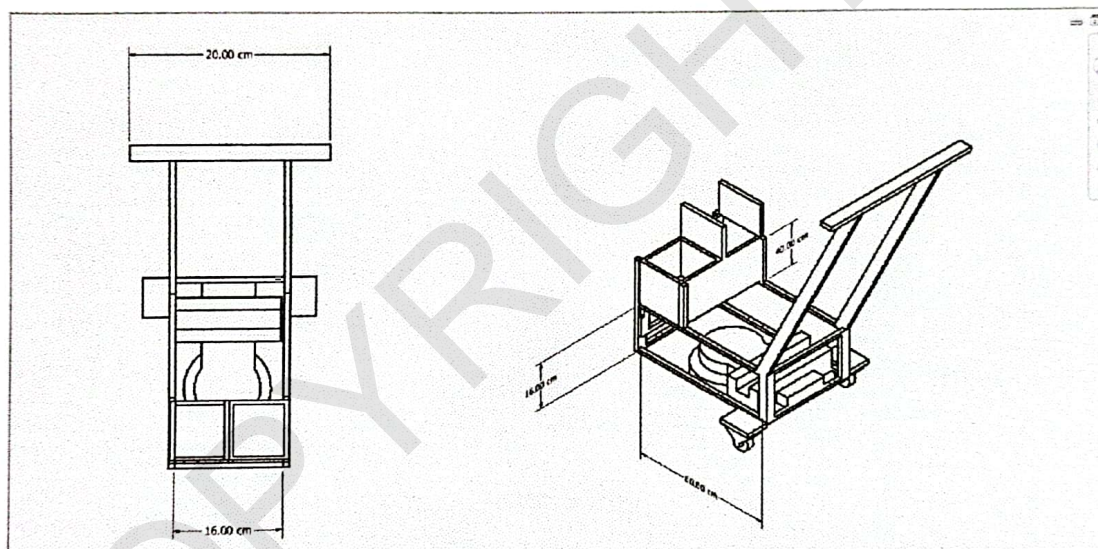


Figure 3.5.2 Detail Drawing

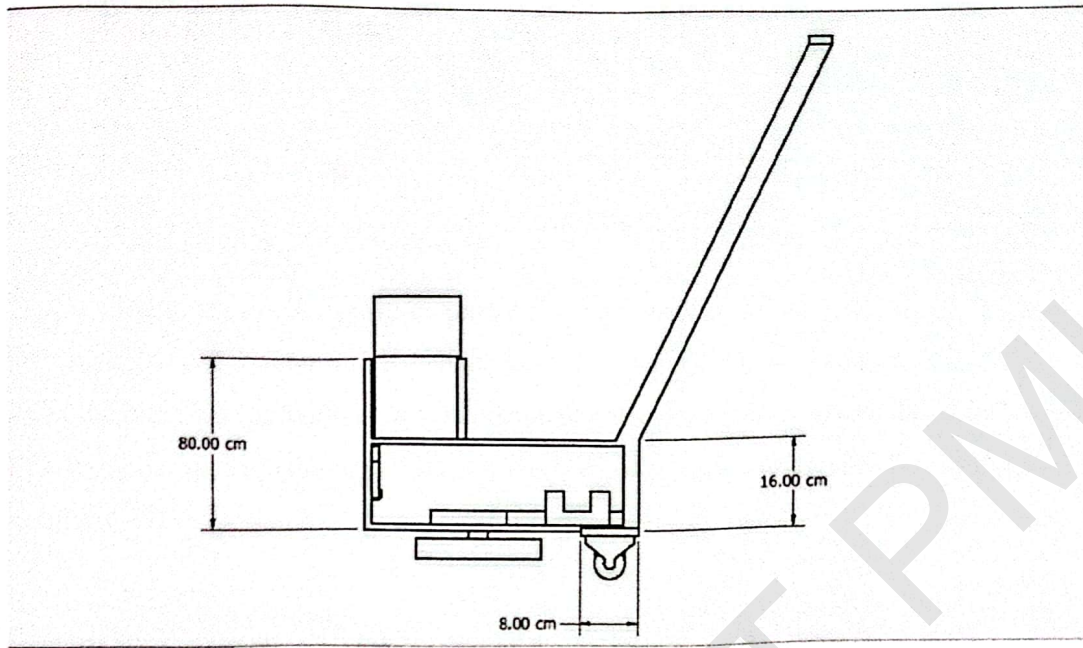


Figure 3.5.3 Detail Drawing

3.6 Fabrication Process

3.6.1 Frame

Firstly, the angle bar are measured its length (40cm x 4) and (16cm x 8) it then marked with marker before being cut. Make sure that the size and measurement are right. Next, end part of the angle bar that being cut just now are grind using grinder. The angle bar then are tag one by one until it become square shape. After that proceed to fully weld it.

3.6.2 Tire holder

Next step, metal plat are measured and marked (8cm x 6cm). The metal plat then are cut using saw machine. Metal plat that has been cut are grind using grinder to remove the part that are dangerous. It then are tag weld to the frame before being fully weld. After tagging process is done it then are fully weld to the frame.

3.6.3 Tire

2 Tire with size (2cm x 4.5cm) length are tag weld below the metal plat of the tire holder then fully weld.

3.6.4 Frame holder

One square bar are measured and marked (110cm x 2) and another one square bar are measured and marked with marker (20cm x 1) and (60cm x 1). The bar then cut using saw machine and grind using grinder to remove sharp edges. After grinding the process are done. The frame holder then are weld.

3.6.5 Frame clasper

The frame are measured it length 20cm and 30cm (below part). The measured part are marked with marker before being drill using drill machine. The marked part are then drill using drill machine. The clasper then are install and lock on the hole that had been drilled.

3.6.6 Installation of Grinder machine

The guard protector of the grind disk are unscrew and removed its part. After done removing process, the disk then changed to polisher brush disk. The grinder machine then are install into the frame clasper and locked to avoid it from moving.

3.6.7 Installation of Tank

The water tank head opener are drilled to make hole for the hose and valve to connect. End part of the water tank are cut half, used for filling water from above. The tank then are installed to the tank frame above the grinder.

3.6.8 Grinder cover

A zinc metal foil size (40cm x 20cm) length x height are cut and grind it end part to remove unnecessary part. The zinc metal foil then bent and put into the frame and cover the grinder. This grinder cover are built to prevent the water from dropping to the grinder.

3.7 Test run Process

3.7.1 Step of Testing The Product

3.7.1 Procedure of experiment

- i. Ensure the bird dropping cleaning machine in the good condition before using it.
- ii. Make sure the disc pad still in good shape.
- iii. Fill up the water and detergent in the tank.
- iv. Do not re-setting the controller valve due to the setting is in the best setting.
- v. Use extension wire to ensure the machine is long enough to reach targeted place.
- vi. Turn on the bird dropping cleaning machine.
- vii. Switch off after using the bird dropping cleaning machine.

3.7.2 Apparatus and Material

- i. Water
- ii. Detergent
- iii. Extension wire
- iv. Grinder pad

3.7.3 Formula

3.7.3.1 Volume flow rate

The volume flow rate Q of a fluid is defined to be the volume of fluid that passing through a given cross sectional area per unit time. The term cross sectional area is just a term often used to describe the area through which something is flowing. Since

the volume flow rate measure the amount of volume that passes through an area per time, the equation for the volume flow rate is like as below:

$$Q = \frac{V}{t} = \frac{\text{Volume}}{\text{Time}}$$

In S.I units (International System of Unit), volume flow rate has units of meter cubed per second, m³/s. since the number of cubic meter of fluid that flow per second.

3.7.3 Safety precaution step of taking care of a machine

- i) After finishing using the machine, the switch must be turn off
- ii) Then, turn off the main switch of the machine
- iii) Make sure the surrounding of the machine should be clean
- iv) Clean the cover of the machine to avoid dust entering the machine
- v) Before leaving the machine put some cloths on it to prevent expose to dust and taking care cleanliness of the machine

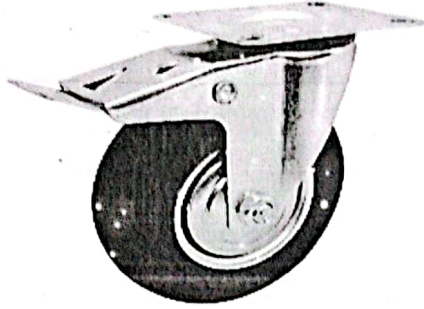
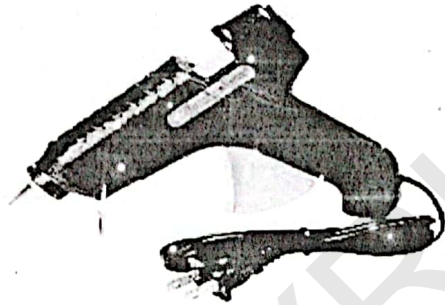

3.7.4 Data table

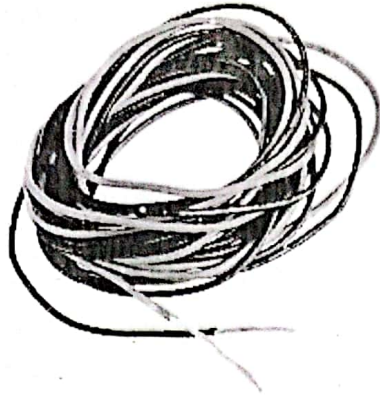
Table 3.7.4.1 Time comparison between manual and bird dropping cleaning machine method

Method Time (s)	Manual	Bird Dropping Cleaning Machine
Reading 1		
Reading 2		
Reading 3		
Reading 4		
Reading 5		
Reading 6		
Reading 7		
Reading 8		
Reading 9		
Reading 10		
Average time taken		

3.8 Material Selection

Table 3.8.1 Lists of materials used

Materials	Function
<p>1) Wheels</p> 	<p>A wheel is a circular component that is intended to rotate on an axial bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines. It helps to ease to move of a machine.</p>
<p>2) Hot Glue Gun</p> 	<p>Hot melt adhesive (HMA), also known as hot glue, is a form of thermoplastic adhesive that is commonly supplied in solid cylindrical sticks of various diameters, designed to be melted in an electric hot glue gun. Helps to glue the pneumatic connector and prevent leaks of water.</p>
<p>3) M.I.G Welding Machine</p> 	<p>Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing fusion. Helps to combine between metal and metal.</p>
<p>4) Wire</p>	<p>A wire is a single, usually cylindrical, flexible strand or rod of</p>



metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Helps to connect electricity to the machine.

3.9 Gantt Chart

WEEKS/PROJECT ACTIVITIES		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
1	PROJECT REGISTRATION	PLANNING												
		EXECUTION												
2	PROJECT BRIEFING	PLANNING												
		EXECUTION												
3	OBTAIN MATERIALS	PLANNING												
		EXECUTION												
3.1	FRAME TYRE	PLANNING												
		EXECUTION												
3.2	GRINDER	PLANNING												
		EXECUTION												
3.2	WATER TANK	PLANNING												
		EXECUTION												
3.4	VALVE	PLANNING												
		EXECUTION												
3.5	CLAMPING	PLANNING												
		EXECUTION												
4	FABRICATE	PLANNING												
		EXECUTION												
4.1	CUTTING FRAME AND HOLDER	PLANNING												
		EXECUTION												
4.2	WELDING FRAME	PLANNING												
		EXECUTION												
4.3	INSTALLING GRINDER IN FRAME	PLANNING												
		EXECUTION												
4.4	WELD CLAMPING TO FRAME	PLANNING												
		EXECUTION												
4.5	INSTALLING HOLDER TO FRAME	PLANNING												
		EXECUTION												
4.6	INSTALLING TYRE AT FRAME	PLANNING												
		EXECUTION												
4.7	INSTALLING WATER TANK	PLANNING												
		EXECUTION												
4.8	INSTALLING VALVE	PLANNING												
		EXECUTION												
5	PROJECT PRESENTATION	PLANNING												
		EXECUTION												
5.1	UPDATE LOGBOOK	PLANNING												
		EXECUTION												
5.2	UPDATE GANTT CHART	PLANNING												
		EXECUTION												
5.3	UPDATE REPORT BOOK	PLANNING												
		EXECUTION												
6	TEST RUN PROJECT	PLANNING												
		EXECUTION												
6.1	PROJECT EXECUTION	PLANNING												
		EXECUTION												
6.2	PROJECT IMPROVEMENT	PLANNING												
		EXECUTION												
6.3	PROJECT WEAKNESSES	PLANNING												
		EXECUTION												

3.10 Summary

There are many processes involve throughout our project. The mention above is very important part of the process for designing and creating our Bird Dropping Cleaning Machine. These processes especially the fabrication part is where we applied throughout our whole semester. From theoretical we managed to apply them practically and it is such a good experience when conducting process involving grinding, cutting, painting, welding, wiring, piping and assembling.

CHAPTER 4

DATA AND ANALYSIS

4.1 Introduction

In this chapter, our group had done a few analysis and data, problem and recommendation for our project. We had done analysis from aspect creativity, tidiness, function, safety precaution and profitable budget. In addition, each project that has been build must undergo test run. This step is really important in building any project in order to know the result of the project.

The test run can be determined either the project has achieved objectives. Besides that, the cost that incurred for the production project must also extremely profitable with revenues received. These factor are important to producing better result for this project. Project is considered successful if no or less problems occur during the test drive is done.

4.2 Comparison of time between manual and machine method

4.2.1 Data Analysis

Table 4.2.1.1 Time comparison between manual and bird dropping cleaning machine method

Time (s) \ Method	Manual	Bird Dropping Cleaning Machine
Reading 1	124.3	50.3
Reading 2	128.9	56.7
Reading 3	127.9	47.5
Reading 4	129.8	54.3
Reading 5	138.9	55.6
Reading 6	149.3	48.6
Reading 7	167.9	50.9
Reading 8	190.1	58.6
Reading 9	218.6	59
Reading 10	221.4	56.7
Average time taken	159.71	53.82

4.2.2 Calculation

Given ;

$V = 400\text{ml}$ (total of two tank)

$t = 203.5 \text{ s}$

using the formula $Q = \frac{V}{t}$

where Q = flow rate

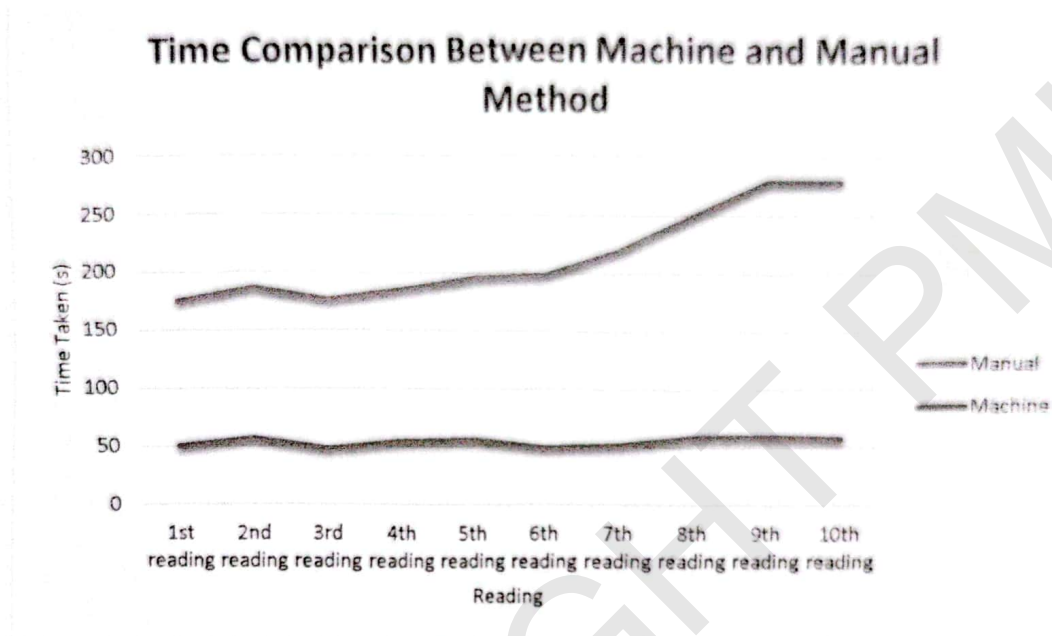
$$Q = \frac{400}{203.5}$$

$$= 1.966 \text{ ml/s}$$

Water tank consumption: 400ml to 2000ml

Max hours usage for the machine: 10 - 12 minutes

4.2.3 Graph



Graph 4.2.1 Time comparison between machine and manual method

The line graph shows that the comparison of time between using the machine and by using manual method. The experiment is run at 3rd floor of Mechanical Department by setting the area of 1 square feet x 1 square feet to take the time taken for machine to clean the area and by using manual method which is using broom and detergent.

The result shows that there is a big difference between both methods. Manual method seems to consume more time compare to our bird dropping cleaning machine. This is because only by using broom and detergent, this method requires a lot of energy to clean the bird dropping. Besides, this method also does not give a satisfactory result. Manual method can only clean up to 10% - 20% top. As the time goes by, we are getting tired to clean because it consume a lot of energy which affect the result by increasing the time taken to clean the bird dropping.

Compare to our bird dropping cleaning machine which have better result rather than manual method. This machine give a good result which it can clean up to 70% - 80% top. Although the machine can only use till 12 minutes top, but it can help to save more times compare to manual method. This is because each area only need 1 minute to clean.

4.3 Safety precaution

4.3.1 Safety precaution on ourselves

Almost of accident happened because of carelessness attitude and not take serious about safety. One of the factor that to prevent accident are:

- i. Always follow the order of PPE(personal protective equipment) at the work place
- ii. The hair should be neat and tidy as for long hair should be tied.
- iii. Avoid playing or joking while in work station which can cause serious injuries.
- iv. Students should not wear any ring, necklace or watch to prevent it stuck to the machine and would cause injuries.

4.3.2 Safety precaution while handling machine

As usual, accident can be avoided in few ways:

- i) Every machine should have earth connection to avoid machine short circuit and cut off all electrical machine
- ii) Handle with care with sharp item such as tool bit or cutter.

4.3.3 Workplace tidiness

The tidiness and neatness of the work place should be taken seriously other than avoid injuries, which also can increase the productivity and skills during working. So some action should be taken seriously:

- i) Don't litter at the work place

- iii) Work place space should have a good air flow and should have sticker zone to remind that they are entering working zone
- iv) Do not let scrap metal being thrown around on the floor either around machine
- v) Fire extinguisher should be placed in a suitable, easy to be found and able to get it during fire emergency.

4.3.4 Safety precaution step of taking care of a machine

- vi) After finishing using the machine, the switch must be turn off
- vii) Then, turn off the main switch of the machine
- viii) Make sure the surrounding of the machine should be clean
- ix) Clean the cover of the machine to avoid dust entering the machine
- x) Before leaving the machine put some cloths on it to prevent expose to dust and taking care cleanliness of the machine

4.4 Analysis of costs

To fulfil our requirement budget for producing our bird dropping cleaning machine project, we make a list to ensure the right amount we had used to spend. The purpose of analyzing our budget costs to ensure our project is inexpensive and qualified in marketing price. Our budget lists are listed below:

Table 4.4.1 Analysis of costs

Material	Price (RM)	Quantities	Total Price(RM)
Polisher	50.00	1	50.00
Angle Bar 1"x1"	33.00	1	33.00
Square Bar Metal	28.00	1	28.00
Water Tank	6.90	2	13.80
Wheel	4.80	2	9.60
T-Valve	5.00	1	5.00
Valve Connector	5.00	4	20.00
Cable Wire	15.00	1	15.00
Cable Tape	1.00	1	1.00
Steel Band	13.60	1	13.60
Zip Tie	9.90	1	9.90
Total Price			RM 321.30

4.5 Summary

After the completion of our project, from assembling the parts of the grinder and water tank and piping, test run is conducted. This is to ensure that the project produced is a success and hence achieve its objective. Improvement and further modification is made if any parts having failure of its function causing error while operation process.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

From the generated project, the project gives a lot of benefits for general workers. The project was produced based of observation that had been made. Besides, the product also have a safety features so that there are no problem occur during test run. Each project that has been created need to go through testing measures as well as the Bird Dropping Cleaning Machine project. The result can be determine either the project can achieve the main objectives. Besides, the cost incurred should also be profitable to the result that had been carried out.

5.1.1 Conclusion

Based on our objective we are able to achieve the three main objective which are to produce a bird dropping cleaning machine, reduce time to clean bird dropping compare to manual method and able to use wasted materials from surrounding. Our machine is more efficient rather than using manual method. In conclusion we able to achieve our objectives.

5.2 Problem occurred during fabricate the machine

5.2.1 Problems with the grinding disc pad

- The grinding disc pad are very limited and very small (100mm) due to less from supplier.
- Grinder disc pad should be change after a few usage.

5.2.2 Problems with the switch on/off of the grinder

- The switch located at the grinder which make operator need to bend down their body to switch on the grinder.
- We custom the switch to put it at the holder to make it more ergonomic to user.

5.2.3 Problems with tube

- The tube is hard to bend and it is not that flexible which can cause the water blocked between the tubes.
- We try to bend it by using heat which make the rubber to loosen up and we bend it before it cool down and harden.

5.3 Recommendations of the Project

For our recommendations of the project, we found out something to be upgraded, which are:

5.3.1 Portability of design

Portability of design is very important to choose a good project, it is the ability of product to be easily and safely, for future we decided to make a portability design, so it is easy to use and lift when we want to use it

5.3.2 Sprinkler instead dripper

Pressure water for sprinkler is high, than dripper so sprinkler is the best method to use for bird dropping cleaning machine, otherwise sprinkler is for large area to supply, instead dripper is for specific areas only. Using sprinkler for future is suitable.

5.3.3 Upgrade grinding disc pad

Upgrading disc pad is very important to make sure the progress of this machine is working properly, and the bird dropping will be cleaning widely.

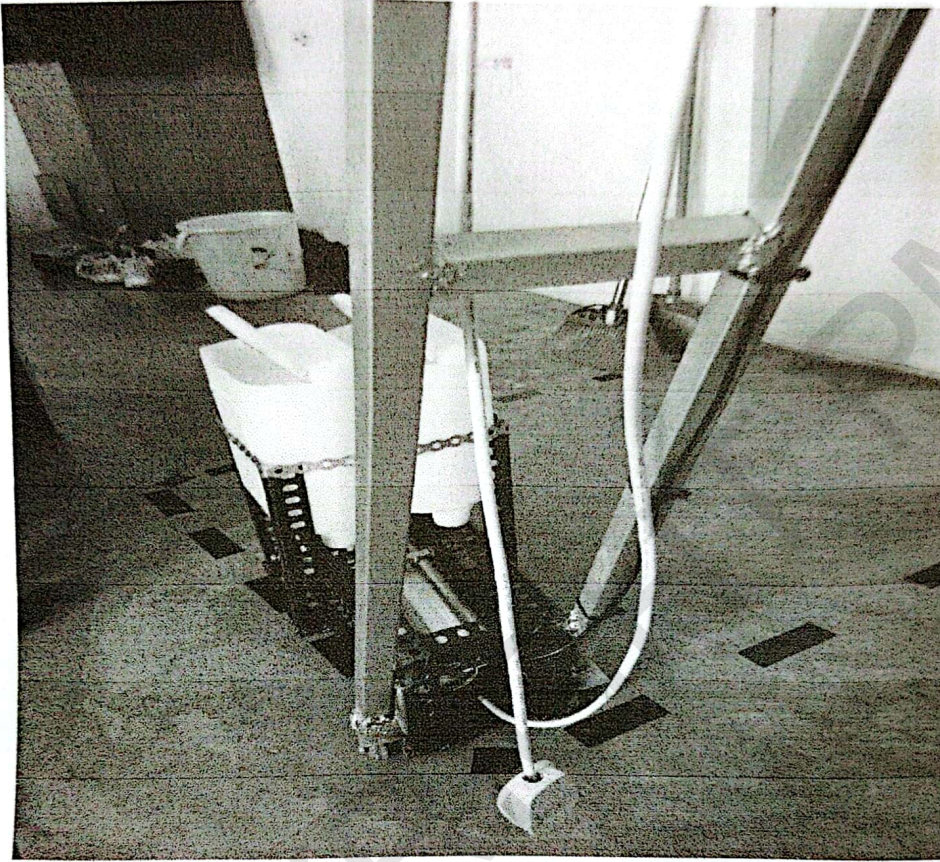
5.3.4 Used aluminum or stainless steel for frame

As we know aluminum or stainless steel are the best material that use to make frame, so for future we recommend to use that material to prevent rust due to water or environment.

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ATTACHMENTS



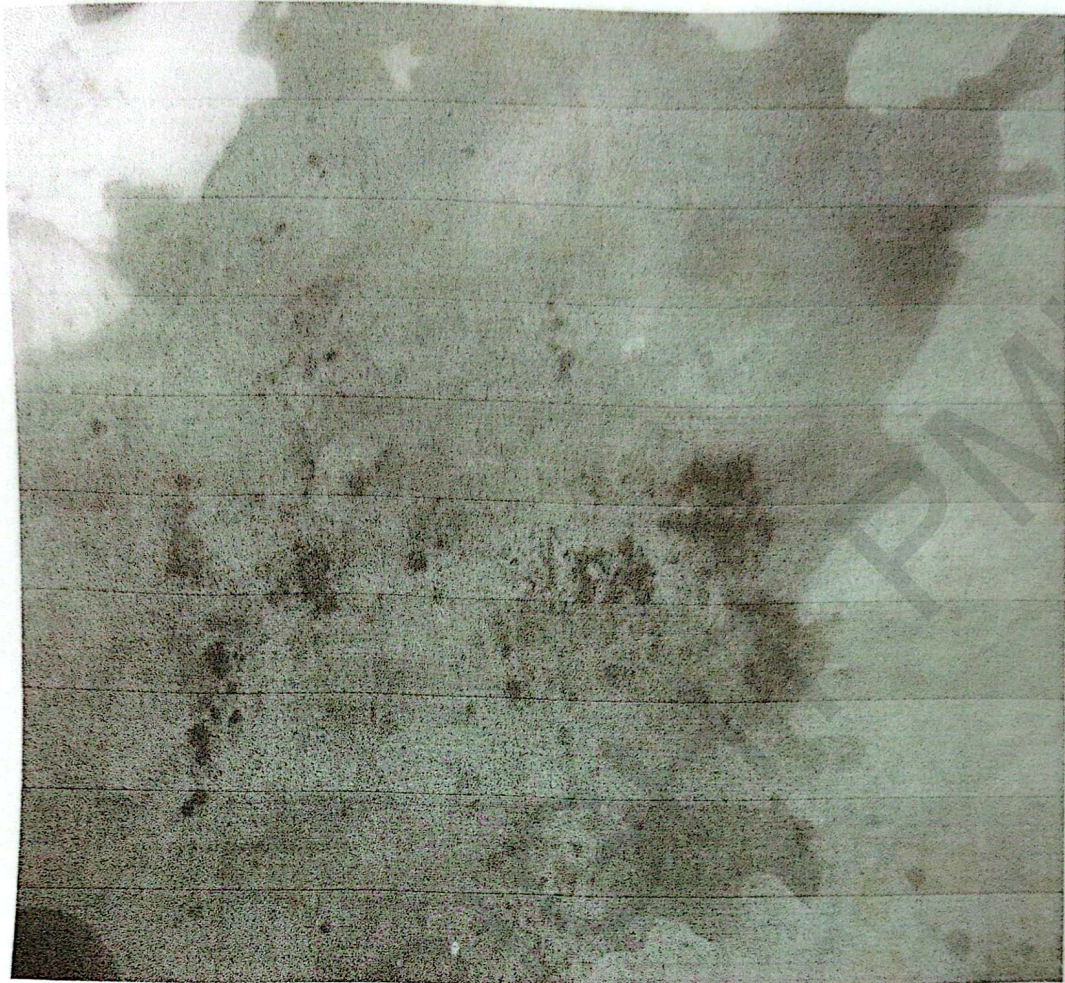
Bird Dropping Cleaning Machine



Cleaning the Bird Dropping using Manual Method



Cleaning Bird Dropping using Broom



Condition of Bird Dropping after Mixing with Detergent



Fabrication Process