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# PROPOSAL

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BABY WASHING MACHINE



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JAN 17, 2022

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PSA

# DECLARATION OF ORIGINAL WORK AND INTELLECTUAL PROPERTIES

TITLE: BABY WASHING MACHINE

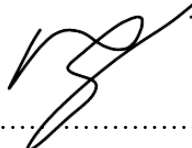
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1. We are a final year student majoring in Diploma in Mechanical Engineering, Mechanical Engineering Department, Politeknik Sultan Salahuddin Abdul Aziz Shah, of Persiaran Usahawan, 40150 Shah Alam, Selangor. (Hereafter referred to as “the Polytechnic”).

2. I acknowledge that the ‘Project above’ and its intellectual property are the original work/copy of our work without taking or imitating any intellectual property from others.

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## **ACKNOWLEDGEMENT**

I would like to express my deep gratitude to Encik Mohd Nasir Bin Kamaruddin, our Project Supervisor, for his patient guidance, enthusiastic encouragement, and useful critiques of research techniques. Encik Nasir has given us much advice and encouragement to ensure that our progress was always going smoothly. Due to this, we have finally accomplished our final project called Baby Washing Machine. This challenge turned into designed to offer advantages to all users and hope that this project can benefit their life instead.

Without the cooperation of group members (Ng Wei Hong, Amin Farhan bin Muhamad Basri Darul, and Ainna Natasha Binti Zubir), all parties, especially Politeknik Sultan Salahuddin Abdul Aziz Shah and also our supervisor, we trust that this venture and very last report cannot be finished well without the useful resource of the party. Moreover, it's far an affidavit of our assignment and our careers withinside the future.

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During the technique of creating this project, likely there are lots of errors are made without us figuring out it turned into a mistake. Therefore, we seek forgiveness and lots of gratitude to the Politeknik Sultan Salahuddin Abdul Aziz Shah and our supervisor. Also, all of the workforce whether or not involved or not that gave us a lot of guidance and cooperation for our project.

Lastly, we hope from this final project report can meet all requirements set out from the Politeknik diploma for Malaysians. Thank you.

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## **BABY WASHING MACHINE**

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### **ABSTRACT**

The purpose of this study is to further improve the existing mini washing machine for users. We also undertake some brainstorming to solve the problems that consumers are having. Why was a washing machine needed in human life? This is due to the washing machine's ability to deodorize the consumer's garments while using less energy than washing clothes beside the river. Our project has been accepted because we can guarantee that the product would work properly and solve an issue that many people encounter today. We do study the issues raised by the findings and research to guarantee that our initiative would be beneficial to all users. Most consumers have experienced the same issue: modern washing machines are taking up too much space. For example, people who live in the apartment were obliged to connect their washing machine to the water supply near their bathroom and this will cause a narrow space in that room. Due to this situation, we have designed a Baby Washing Machine to free up more space. Besides that, existing mini washing machines don't have a safety door lock system to stop the electricity while the lid was opened. To avoid hazards happening to the user, we have included the safety door lock system in our project. We are targeting dormitory students, and those who live in rental residences because they require things that are easy to transport and use. We are seeking more features to put in our project. The features needed to be tailored to the difficulties that society was suffering. For the construction of this product, we are seeking the ideal materials with excellent quality to produce a high value with the excellent durability of the product. In a nutshell, we will put full commitment into this product to meet our goals.

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**Keywords:** *Baby Washing Machine, Portable, Mini*

# INTRODUCTION

## 1.1 Introduction

Washing clothes is the oldest culture in the history of human civilization. Since the time of our ancestors, clothing has been known to cover the body and genitals. At the same time, cleaning clothes to remove stains and odors have become a habit. In earlier times, they washed clothes by hand by the river. Nowadays we have a washing machine, and it helps us a lot to clean clothes, perfume our clothes and helps a lot to clean a lot of wear but has some problem factors like having a large size and consuming a lot of space it makes it difficult for users to find a suitable place to be placed. In addition, this washing machine is also very heavy to move anywhere, if you want to move house, buy a new machine it is very difficult to move it from one place to another. Next, the existing washing machine does not have auto soap parking; it is difficult to estimate the soap intake and it will give problems to the consumer's clothes. Therefore, we created this Baby Washing Machine to solve the problems faced by users.

## 1.2 PROJECT BACKGROUND

In this modern era, washing machines have become an important automatic washer household today. A washing machine is a machine designed to wash or clean laundry. It has changed our laundry wash from washing board to the electric washing machine, and it became our major time saver. Without washing machines, women are mainly the ones burdened by the washing of clothes and can spend an entire day washing clothes. Outdated manufactures of automatic washers have gone to great lengths to reduce cost.

For instance, expensive gearboxes are no longer required, since the motor speed can be controlled electronically. Although the accessories cost has been deduced, the other costs such as detergent, material, electricity, and water usage were still high expenses.

Besides that, the large capacity of washing machines was too heavy to carry. Usually for an existing washing machine will be placed in a specific place for around 10 years, and it



making our spaces more limited.

Hence, with this scenario, we would like to create a washing machine that comes with a new design, small capacity has fewer expenses, and didn't lose the features the existing washing machines have. With this project, it helps to bring some respite to all walks of life especially to the people who live in small apartments or buildings. The benefits that it brings not only save a person's time and money it also makes a person's limited space to be maximallyutilized.

### **1.3 Problem statement**

The problem is that the existing washing machine is large and takes up space. So, we will build a washing machine that is appropriately sized and not too big for the user. Besides that, the existing washer machine is very heavy and difficult to move from one place to another. We have tried to minimize the size and the weight of the Baby Washing Machine, and it can be carried by users easily. Next, the usage of detergent and water on the existing washing machines was large, this can burden the users on paying additional costs. Using the Baby Washing Machine has successfully resolved the issues of using a large amount of detergent and water. This is because we have installed Auto Soap Parking, and Water Level Sensor to control the amount of detergent and water that is needed per washing cycle. Therefore, a modern control panel design is needed to control the whole process and component of the Baby Washing Machine. The use of the PCB board is to command the cycle of wash, rinse, spin, and make these cycles run automatically after pressing the start button. Indirectly to guarantee well-being and user-friendliness.

### **1.4 Objective**

- i. To cut down on detergent usage, electricity, and water bills.
- ii. To maximally utilize your limited space.
- iii. To design and fabricate the baby washing machine.

## **1.5 Question project**

- i. Is it possible to efficiently reduce the cost of electricity and water bills?
- ii. What kind of design can make our product work as a normal washing machine?
- iii. Is it more user-friendly than the existing washing machine?

## **1.6 Scope**

The scope of the study in our project is suitable for people who in between the ages of 18 to 60 years. Besides that, our product was suitable for people who live alone, students sitting in dormitories and the person who lives in a rented house. In addition, Baby Washing Machine was aimed to wash 4kg of garments in a full auto washing cycle. It is more user-friendly, due to the command of the PCB Board, the full process was run automatically after clicking on the start button on it.

## **1.7 Importance Of This Project**

The importance of this project is to make it easier for everyone to clean their daily clothes. Our product not only focuses on housewives but is also friendly to use for individuals who live alone in a house with small spaces, and it is also suitable for students who are in dormitories or universities. This project can make benefit someone's life by maintaining their garment's cleanliness and in terms of time, manpower and money.

## **1.8 Definition of Terms/Definition of Operations**

The definition of this project is to make it easier for everyone to maintain the cleanliness of washing clothes daily. The project is also built to overcome the problems of people who are in the trouble with a lack of money, lack of space in the house, heavyweight that cause it difficult to move, and so on. There are also mini washing machines on sale in the market, but the functionality and specification were different from our product. We

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decided to build Baby Washing Machine is to solve the drawbacks of the current mini washing machine have and innovate it to become more functional to users and so on.

## **1.9 SUMMARY**

The summary of this chapter is to provide an understanding of the introduction to this Project. The studies have explained the origin of ideas and inspirations. The goal for this project in conjunction with the significance could be to be comfortable and mild inflicting it to be extra convenient for the scope of this project only. We hope that the understanding of chapter 1 will be able to describe the situation or design of this project and provide an idea of how this project works as well. We also hope to interest you to know and understand more about this project.

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## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

**Prepared by Ng Wei Hong**

In this chapter, three types of washing machines that are selling in current markets will be shown. The 3 types of washing machine have its pros and cons that will be compared to our product which have its advantages and specialties too. In the 1790s, the first rotating drum washer called “Patent Washing Mills” was sold numerous in England. The use of enclosed containers or basins with grooves, fingers, or paddles to scrub and rub the garments was one of the advancements in washing machine technology. Although this primitive agitator was driven by hand, it was still more effective than genuine hand washing. Previously, all of the water required for washing, boiling, and rinsing the laundry had to be carried by the maids, laundresses, or housewives. The laundry water would be taken by hand, heated over an open fire for washing, and afterward poured into the tub to produce the warm soapy water. The least unclean items will be washed in soapy water first, followed by the dirtier clothes. After washing, soap and water were removed from the garment in a separate procedure, with the soap being rinsed off with clear water. The soaking wet garment would be rolled up and twisted by hand to extract water after rinsing. The entire process often occupied an entire day of hard work, so it was a heavy-duty for women in that centuries.

In the year of 1937, the first domestic automatic washing machine was introduced. Automatic washing machines were originally connected to a water supply using temporary sink tap connections. Permanent connections to both hot and cold-water supply became commonplace later. In the 1950s, General Electric also introduced its first top-loading automatic washing machine. The Hoover Company also produced an early type of automated washing machine that utilized cartridges to configure several wash cycles. "Keymatic" was the name of the system, which utilized plastic cartridges with key-like slots and ridges around the edges. Early electric washers were single-tube, wringer-type devices that were exceedingly costly as fully automated washing machines. Due to the low cost of the Rolls Razor washers, twin tub machines temporarily became quite popular in the 3960s. Two tubs, one larger than the other are found in twin tub washing machines. The smaller tub was a centrifugal drying

spinning drum, whereas the bigger tub just had an agitator in its bottom. Since the 1970s, electronic motor speed regulation has been a standard feature on higher-end machines.

In now modern days, washing machines become more modern and the motor speed can be controlled electronically. Nowadays washing machines were separated into 3 different types. So in this chapter, the 3 types of washers will be explained and the comparison between those washers to our product.

## **2.2 Top-Loading Washing Machine**

### **2.2.1 Introduction**

Top Loading Washing Machine is a dominant design from the United States and Canada, called a vertical axis cloth washer. The clothes are placed in a spinning ventilated basket that is housed within a water-retaining tub and includes a finned water-pumping agitator in the basket's bottom center. Clothes will be loaded through the top of the machine.

When the washing started, water will be filled into the outer tub to fully immerse the clothing freely in the basket of the washing machine. The water will be pushed outward between the paddles towards the edge of the tub with the movement of the agitator. Following that, the water will travel outward from the basket's sides towards the center, and then down into the agitator, repeating the process that resembles the structure of a torus as a circulation pattern. The direction of an agitator is periodically reversed, this is because the water can be pumped in the torus-shaped motion, but if the agitator just moves in one direction, the water would only swirl around the basket if the motion was constant.

Manufacturers have numerous options for controlling the agitator's motion during the washing and rinsing processes independently with the high rotation speed of the drum. It is required for the spin cycle since the agitator and the drum is separated in the top-loading washing machine.

The top-loading washing machine uses a DC brushless motor to action. The procedure is flawlessly implemented using a front-loading washing machine with a motor capable of reversing direction with each reversal of the wash basket. Top loading washing machines often employ more costly, hefty, electrically efficient, and dependable induction motors.



**Figure 2.2.1** – Top-loading Washing Machine

### **2.2.2 Advantages of Top-loading Washing Machine**

The Top loading washing machine allows an extremely simple passive fabric softener dispenser that operates through centrifugal force and gravity with the top loader's spin cycle between washing and rinsing. When observed through a rotating frame of reference lens, centrifugal force seems to operate on all items. The fabric softener is placed in a cup at the top of the agitator. The fabric softener was drawn by a tapering cup and centrifugal force that gathered in the top of the spinning agitator when the spin cycle began. Once the spin cycle is completed, the centrifugal force no longer suspends the fabric softener, and it automatically falls through the center of the agitator to join the rinse water that comes into the tub.

Top-load washers would be more ergonomically friendly, enabling you to load your clothes at waist height, reducing repetitive joint stress. The most compelling benefits to the top load washing machine were cheaper compared to the front load washing machine.



## 2.3 Front-Loading Washing Machine

### 2.3.1 Introduction

The front-loading washing machine can be called a horizontal-axis clothes washer is the dominant design in Europe. The inner basket and outer tub are mounted horizontally in this design, and the machine is filled through a front door. The door of the front-loading washing machine often but not always contains a transparent window. Gravity and the rotation of the cylinder provide agitation. The paddles on the drum's interior wall raise the garments and then release them, flexing the fabric's weave thus forcing the water and detergent solution through the clothes load. Only enough water was needed to moisten the fabric, this is because the washing action does not require the clothing to be freely suspended in water.

The surface tension of the water and the capillary wicking action produced in the fabric weave limit water usage in front-loading washing machines. A large pile of dry clothing standing in water will soak up the moisture and make the water level drop, because of this the front-loading washing machine always fills to the same low water level then slowly refills to maintain the original water level. Because water absorption takes time with a stationary pile of fabric, nearly all front-loading washing machines begin the washing process by slowly tumbling the clothes beneath the stream of water entering and filling the drum to swiftly saturate the garments with water.

Front loading washing machines are mechanically simple compared to the top-loading washing machine with the variable-frequency drive motor. Due to the drum sitting sideways in front loading washing machines, they have their own set of mechanical issues. A top-loading washer maintains water inside the tub simply by gravity drawing down on the water, but a front-loader must securely seal the door shut with a gasket to avoid water pouring onto the floor all across the wash cycle. The interlocking device will shut the door and ensure that the access door was locked during the entire wash cycle, this is because when opening the door with the water might gush out onto the floor if the machine is running. However, be wary with front-loading washing machines without viewing windows on the door; it is easy to trap fabric between the door and the drum, causing ripping and damage to the pinched garments during tumbling and spinning.



**Figure 2.3.1** – Front-Loading Washing Machine

### **2.3.2 Advantages of Front-Loading Washing Machine**

First and foremost, front-loading washing machine requires less water to wash in a cycle compared to a top-loading washing machine. When less water was required, front-loaders typically use less soap, and the repeated dropping and folding action of the tumbling can easily produce large amounts of foam or suds.

Next, the price of the front-loading washing machine will be cheaper, this is because the front-loading washing machine without the need for a gearbox, clutch, or even crank to be function, this is because it normally being connected to the drum was grooved pulley belt and large pulley wheel.

Besides that, the front-loading washing machine has an interlock inside of it to ensure the security of the machine during the process of the washing cycle. The interlock is generally double-redundant in most machines to prevent either opening with the drum full of water or opening during the spin cycle.

Clothing can be packed more firmly in a front loader than with a top-loading washer, up to the maximum drum volume if utilizing a fabric wash cycle. This is because wet clothes take up less space than dry textiles, and front-loaders can self-regulate the amount of water required for appropriate washing and rinsing. Extreme overloading of front-loading washers squeezes clothes towards the narrow space between the loading door and the front of the wash basket, possibly causing fabrics to fall between the basket and the outer tub, shredding garments, and clogging the basket's motion.

## 2.4 Mini Washing Machine

A mini washing machine is also known as a mini laundry washer. Basically, Mini washing machines are clothes-washing machines that are small in size, capacity, and also design than the conventional washing machine. Mini washing machines work as a standard washing machine, but they require a smaller space that can't accommodate a normal washing machine. Due to its capacity and size, it usually can be used in many different places and also saves electricity because it only requires smaller accessories. Mini washing machines can be categorized into two types, which are human-powered mini washing machines and electric-powered mini washing machines.

### 2.4.1 Human-Powered Mini Washing Machine

A Human-Powered Washing Machine is also known as Pedal-Powered Washing Machine. It is a washing machine that can be constructed easily by using low-cost scrap parts that are available in our daily life. Due to its simple design, the Human-Powered Washing Machine is an innovation that used to be made with cheap parts, very low maintenance cost. It is affordable to each member of society and doesn't cause environmental issues. Besides that, the Human-Powered Mini Washing Machine can work without using electricity which generates power with the drive mechanism through human pedaling. Pedal power can be enabled with far less effort and fatigue compared to drive devices that are achieved by hand cranking. However, this washer only provided a wash cycle only, it can't run the cycle of rinse and drying process.

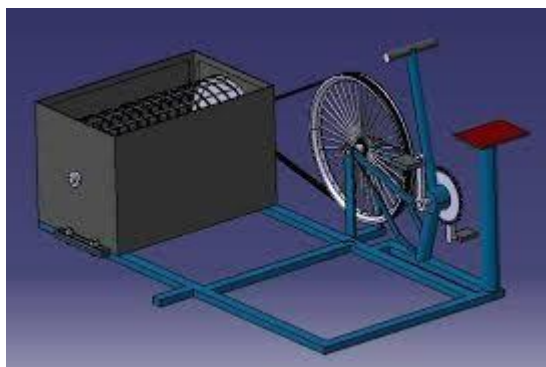


Figure 2.4.1 – Pedal-Powered Washing Machine

## 2.4.2 Electric-Powered Mini Washing Machine

Sonic Soak Washing Machine was the most representative for Electric-Powered Mini Washing Machine. This is a type of mini washing machine that uses ultrasonic technology and works at a microscopic level to clean solvent. People usually use this washing machine to clean items such as jewellery, medical instruments, watches, glasses, electronics components, and so on. It creates high-frequency sound waves called cavitation bubbles to clean items; this can ensure that the item is 99.9% clean. Ultrasound, in addition to being mild, can penetrate nooks and crannies and clean hard-to-reach regions. On the other hand, Sonic Soak Washing Machine is quiet and provides an ultra-gentle wash to delicate garments, but it can cause our clothes to be severely faded due to its high-frequency sound waves.



Figure 2.4.2 – Sonic Soak Washing Machine

## 2.5 Comparison between the Washing Machines

	Front-Loading Washing Machine	Top-Loading Washing Machine	Mini Washing Machine
Water Usage			✓
Efficient Cleaning	✓		
Spin-dry Effectiveness	✓		
Cycle Length		✓	✓
Wear and Abrasion		✓	
Noise		✓	✓
Water Leakage	✓		
Ergonomics	✓		✓

## **2.6 Introduction of Baby Washing Machine**

Baby Washing Machine is generally an innovation of Mini Washing Machine. There are various types, designs, and functions of mini washing machines available in the market and also previous researchers who designed and made it too. After conducting extensive and detailed observations, studies, and surveys, our group has decided and agreed to modify and innovate the mini washing machine in the market.

The implementation of modifying this mini washing machine, we named it as Baby Washing Machine. By the name of this Baby Washing Machine, it is because we have made the 3 cycles (wash, rinse, spin) into 1 cycle with automatically runs by clicking a start button. Besides that, we have designed an auto soap parking on it, so that user no need to pour soap on every cycle runs.

In addition, while the Baby Washing Machine study process, we have also scheduled the Baby Washing Machine manufacturing process based on the design that has been done. We have been influenced by the materials used in the project while the process of constructing our project. Due to the lack of accessories and materials, existing equipment, and limitations in terms of our capital and finance, we have tried our best to use whatever we have in our surroundings and reuse those components, and equipment that are still in a good condition.

### **2.6.1 Specification and function of Baby Washing Machine**

The Baby Washing Machine that we have designed is a mini washing machine that carried the function that an automated washing machine has to it and minimizes the size. However, we innovated, modified, and redesigned in accordance with the problems, research, and data collection that we have done to overcome the obstacles and to achieve the objectives. Our Baby Washing Machine was modified with a combination of PCB board, A/C Retractor, Water Pump, Inlet and outlet valve, Water level sensor, A/C Motor, and Switch. PCB board is to combine the 3 cycles (wash, rinse, spin) into one cycle, A/C retractor is to open the outlet valve, Water Pump is to suck the water into the washing machine through an inlet valve, Water level sensor is to remove the water from the Baby Washing Machine, A/C motor is to move the paddles and drum, and switch is to cut off the electricity while the door was open. The Baby Washing Machine was estimated to load with a maximum capacity of 2-3 kg of clothes. With the material of plastic, the Weight of a Baby Washing Machine was very light which is 4kg, so it can be easily carried by a user from one place to another places. This is the modification that we have made to achieve our objectives.

### **2.6.2 Mini Washing Machine in the market**



Figure 2.6.2 – Mini Washing Machine in the market



Figure 2.6.2 has shown that a mini washing machine that currently selling in the market. This mini washing machine can be searched on online shopping platforms such as Shopee, Lazada, Taobao, and so on.

Through the observation and research that we have conducted, this Mini Washing Machine is made from a combination of Power Source Board, Timer, D/C Motor. This mini washing machine has 2 cycles only which are Wash and Spin, it can only choose the cycle manually on Power Source Board. On the Power Source Board, it has a timer switch on it, user needs to schedule the washing cycle period and also the spinning cycle period by twisting the timer. With the D/C motor, this mini washing machine can only wash in one direction only which is anti-clockwise. This can cause the garments are not fully clean since it can't imitate the process of handwashing such as rubbing the clothes. The user needs to be careful from a hazard such as electric shock, due to the earth wire was not connected to all the accessories and components that conducted electricity in this product. Users need to pour the water and also the detergent by themselves on each cycle of the wash.

### 2.6.3 Comparison between Baby Washing Machine and Mini Washing Machine

Baby Washing Machine	Mini Washing Machine
<ul style="list-style-type: none"> <li>• Using Plastic as the main material</li> <li>• Using PCB Board as the control system and timer</li> <li>• Using A/C Motor</li> <li>• Has a Door Lock System</li> <li>• Has an Auto Soap Parking</li> <li>• Have a Water Pump on the inlet valve</li> <li>• Have an A/C Retractor on the outlet valve</li> <li>• Have a water level sensor</li> <li>• Have earth wire that connected to all components and accessories that conduct electricity</li> </ul>	<ul style="list-style-type: none"> <li>• Using Plastic as main the material</li> <li>• Using Power Source Board as the control system</li> <li>• Using D/C Motor</li> <li>• Has a manual timer</li> </ul>

Figure 2.6.3

From Figure 2.6.3, the difference between Baby Washing Machine and Mini Washing Machine was stated. In terms of functions and additions that we have innovated based on the problems and objectives that we have observed and concerned.

## 2.7 Component List

### 2.7.1 Water Pump

The water pump in a washing machine is two separate pumps in one. This rotates the water in two directions as it cycles through the machine. It circulates water during the wash cycle and releases water during the spin cycle. The drain line is connected to the bottom part of the pump, while the top half recirculates the wash water.

A water pump can reverse direction when the motor drives to it. The washer is performing a wash cycle and recirculating the water, it spins in one direction. When the washer is conducting a spin cycle and emptying the water, it spins in the opposite direction.



Figure 2.7.1 – Water pump

### 2.7.2 Paddles

Paddles are located inside the tub of the washing machine and help perform the cleaning of the clothes. The spinning inner drum of the washing machine includes paddles that are controlled by a rotating disc. Paddles are designed to move the clothes around during the wash to allow the detergent to work and remove dirt particles and soiling from your clothes, helping the clothes rub together while washing.



Figure 2.7.2 – Paddles

### 2.7.3 Motor

The motor is combined with the agitator or the disc that turns the drum, it produces a rotator motion. It can be used to agitate the drum (both forwards and in reverse) by switching the field winding concerning the armature. The motor can also be the run-up to the high speeds required for the spin cycle.



Figure 2.7.3 – Motor

### 2.7.4 Timer

The brain that governs the washing machine's systems is the washing machine timer. This aids in the manual or automatic setting of your clothing's wash time. Although timers are tough, they contain several small elements, such as springs and moving contacts, that might malfunction and cause the machine to stop working.



Figure 2.7.4 – Timer

### 2.7.5 Drain Hose

Typically, the drain line is located on the rear of the washer. The drain hose removes wastewater from the machine, while the water pump supplies it with clean water. The washer pump pushes the water out of the machine's bottom into the drainpipe. From allowing the tub to fill, the drain line loops around the machine and down to the drain.



Figure 2.7.5 – Drain Hose

## 2.7.6 Printed Circuit Board (PCB)

A Printed Circuit Board (PCB) is a circuit board containing electrical components for commanding machines that typically serve as the washing machine's brain. The circuit board is in command of nearly most of the washing machine's operations such as when to fill up the water or rinse the clothing. The circuit board is in charge of ensuring that the machine accomplishes all of the washing operations correctly, as well as scheduling them.



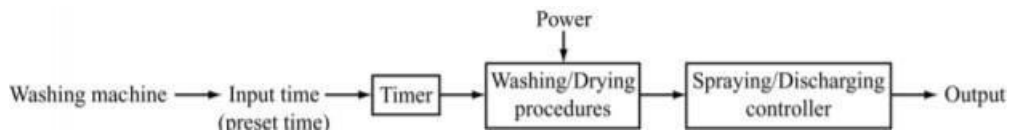
**Figure 2.7.6 – PCB Board**

## 2.8 Control System in Washing Machine

**Prepared By: NG WEI HONG**

A control system is a set of devices that controls, manages, or regulates the actions of other devices or systems in order to achieve a specific goal. Control systems, a procedure created to keep a process variable at the desired value, and that's how a control system accomplishes this. Hence, there are two main types of a control system is Open-loop and also Closed-loop control systems. The Open-loop control system was the control system that the washing machine used.

An open-loop control system, also known as a manual control system, is one in which the control action is completely independent of the system's output. An open-loop control system is the same as a washing machine. An open-loop system's input and output are unconnected. An example is that the operation of a washing machine does not depend on the cleanness of the clothes, but rather on the pre-set time. An open-loop control system's structure and control mechanism are both relatively basic, but the output relies on whether the input signal is acceptable or not.



**Block Diagram 2.7:** Open-loop Control System (Washing Machine)

An open-loop control system has the shortcoming of not being capable of adapting itself automatically. The system will not make the necessary modifications even if the magnitude of the output is too large or too little. As a result, an open-loop control system cannot be used to control a complicated system. It may even be necessary for the user to be supervised and act. For example, when a washing machine finishes cleaning the garments, the user must analyze them to see if they are clean; if not, they must be re-washed.

## 2.9 CHAPTER'S SUMMARY

In a nutshell, the literature review is important to showcase all the studies of types and components to enhance the knowledge on this project.

After a lot of guidelines and methods were discussed and research was done, we would like to create a washing machine with the innovation of a top-loading mini washing machine to our product called Baby Washing Machine. Which is Baby Washing Machine will be using less water used to produce an efficient cleaning process. With less water usage was needed in the washing cycle, it will also cut down the usage of detergent and electricity. Besides that, with less usage of water to wash, the time of the washing process will be shorter compared to usual. This implementation was able to achieve the objectives of our study.



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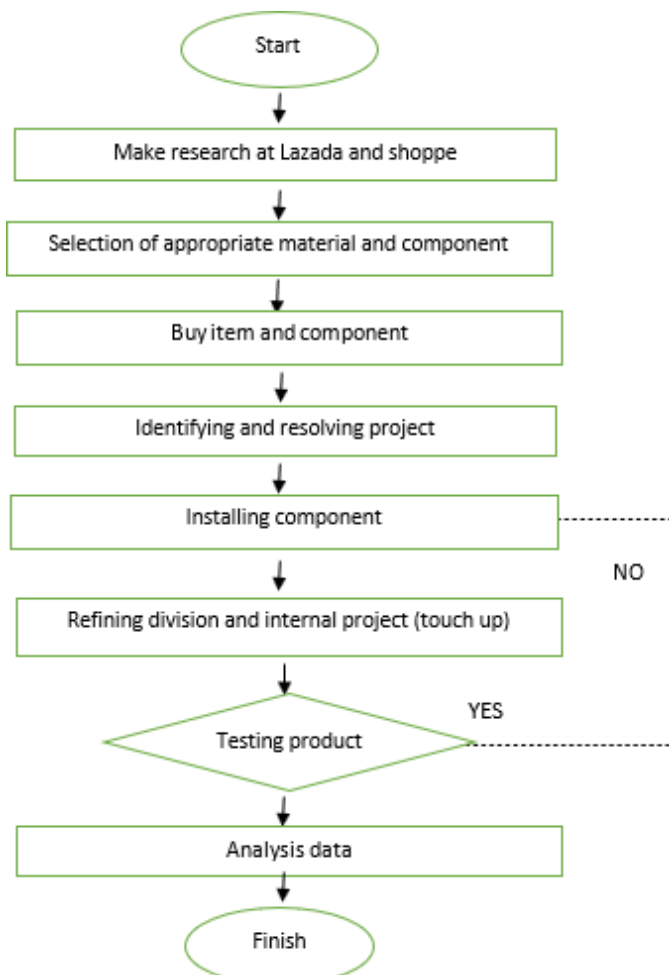
# METHODOLOGY

## 3.1 INTRODUCTION

Prepared By: Amin Farhan Bin Muhamad Basri Darul

The methodology can be defined as a systematic sequence of activities to solve problems by developing a new product or modifying the existed product. For our project, we are modifying the existed product that we bought online. In this chapter, there will be a lot of information about the process and journey throughout making a renovation of the mini washing machine. This chapter also will talk about the flow chart, tools that are used, components, project methodology, and design. after that, this chapter also talks about safety while we make a renovation in this project. Next, we will talk about the type of research as sampling, data collection method, and data analysis method

### a) FLOW CHART



## 3.2 PROJECT DESIGN

For our design after we already make research and discussion as a team. We decide to buy a product that is compact design and portable, the same as an existed washing machine, but the size is small not too big as usual we use at home (figure 3.2). For the material, we choose plastic as you can see in figure 3.0 the body is from plastic also the pipe, etc. because it's free from rust. if we use steel it's easy for rust and non-durable.

Another reason we choose plastic is that superficial so easy to move from a place to another place. For the engine, we just use an ordinary motor which we just recycle from the existed motor and we install some components into our product to make it complete and perfect.



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Figure 3.2

### **3.2.1 TYPES OF RESEARCH**

#### **a) Sampling**

The technique sampling that we use for our project is simple random sampling because it is easy to use than systematic sampling, stratified sampling, cluster sampling, purposive sampling, convenience sampling, and snowball sampling. We take sampling at random from the social media and we make research one by one to get an idea to look for the problem that we need to solve in sampling to improve our project to be better than an existing product. We also use this sampling technique for understanding the concept of such sampling workand our project.

#### **b) Data Collection Method**

The data collection method that we use to achieve our objective project is the quantitative method. We provide a virtual questionnaire form that is “google form”. We use google form because of the covid 19 pandemic that makes us can't go out to give questionnaire form, so we decide to use google form that doesn't make any contact, keep our distance, and follow the SOP that the government has given. In this method, we provide some questionnaires about the problem related to equipment and washer machine or mini washing machinethat they use in daily life. We share our questionnaire form with our friend who is studying, family and citizen to get the data about the idea how to improve our product in term of the design project, material, function, etc. we also make some research at google, website, YouTube, and we also asking someone more professional and has a lot of experience in the repair or make renovation washing machine.

#### **c) Data Analysis Method**

The data we collect we well separate two parts; one is negative and another one is positive. The data we get we will analyze one by one, and we will use it to improve our project be better. The negative data we will take it and make it to improve our product and we will take notes one by one. For the positive one will keep it for our project, and we will use theidea of the questionnaire to make the best renovation.

## **3.2.2 REAL TYPES OF PROJECTS.**

### **a) Project Implementation Process**

In this process, the first thing we focus on this project is the selection of mini washing machine as you know we make a renovation, so we buy at Shoppe. At Shoppe has a lot of types of mini washing machine so we choose the one which same with the old existed one. It is solid and superficial so it's suitable to use it. The second is the design of the project. After we decide the mini washing machine which one, we want to buy. We discuss the design of the project it is also the important one to ensure that the project works well. So, we make research about the appropriate design for our project to ensure that the project will work brilliantly. The third is engineering analysis. Analysis engineer is a matter of concern because without engineering analysis some of the project components could not be produced well. So, we did the engineering analysis to ensure our project can run smoothly and easily.

### **I) Manufacturing Process/Method**

Before we start the renovation process. We will make the process of feeding the project material and tools to the building project to ensure the manufacturing process can be carried out in an orderly. After that, we will make a process planning list to ensure the process project renovation in a systematic and controller manner. Apart from that, we used the grasping method which is called 'Hot Glue Gun' to glue the parts and material made from plastic. For the wire part, we use soldering iron to connect the wire to conduct electric current. We also use the drill to make a hole and drill some screws to combine some parts.

### **II) Theoretical Problems/Design/Problem Solving**

We are using the 'plug, testing and repeat' method. After we make some parts, we will install that part and testing that part until that part works well. If got some problem or mistaken or not working in that part, we will repair it and we will repeat the same process at that part only to make our product working well.

## b) Material And Equipment

### I) List Of Equipment

#### 1. Drill



- To make a hole for safety door lock
- To screw and unscrew

#### 2. Test Pen



- Used to test circuit quickly to ensure that the circuit or conduct is live or not

#### 3. Screwdriver



- To Screw and unscrew

4. Wire Cutter



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- To cut wire

5. Player tool



- To cutting and pulling, rather than squeeze

6. Hot glue gun



- Joining modeling material

7. Electrical insulation tape



- Used to insulate electrical wire

8. Electric cutter



- Cutting PVC and material

9. PVC sealing tape



- Used for sealing pipe



## List Of Materials

- PCB board
- A/C trapper
- Transmitter/capacitor
- Water level sensor
- 2 in/outlet water valve
- PVC pipe
- Container
- Mini washing machine
- Switch
- Rubber band
- Spring
- Wire
- Screw
- Engine

## II) Description Of The Design

Design and size of this project – the shape of this project is a cuboid shape, and the size project is 33cm height x 30cm width x 43.2 length. It can load 4.5kg- 5kg cloth at onetime. It is made from plastic and the voltage that was used was 220(V), the power was 260(W).

## III) Manufacturing Cost

No	item	Quantity	Price/unit(RM)	Price (RM)
1	PCB board	1	8	8
2	A/C trapper	1	15	15
3	Water level sensor	1	5	5
4	In/outlet water valve	2	2	4
5	Mini washing machine	1	65	65
6	Switch	1	15	15
	Total	7	110	112

### ➤ **Recycle Item**

No	Item
1	Rubber band
2	Screw
3	Transmitter/capacitor
4	PVC pipe
5	Container
6	Spring
7	Wire

### **C) Analysis Method**

We have arranged and analyzed the data, so it makes our work easier to modify the product. The data we analyze is we make the existed product to have an auto soap, that make from the container we got from recycling and we used hot glue and PVC pipe to combine with machine. Next, we create a new system that can make the valve can automatically open and close using a rubber band, spring, and container. We also connect the check valve and A/C retractor. A/C retractor that we are using just can function three terminals but PCB board just one terminal only. So, that means it just pulls half rubber band not overall. That is why we use a rubber band and spring for the pull A/C retractor. After that, we used plastic material because it is easier for a person to bring the product everywhere. We also make a safety lock door system to ensure the safety of the user.

### **3.3 SUMMARY**

In summary, there is a lot of information about the process and journey throughout make a renovation of the mini washing machine. This chapter also talks about the flow chart, tools that are used, components, project methodology, and design. after that, this chapter also talks about safety while we make a renovation in this project. after that, we also learn to create a system and learn how to make a renovation. Plus, we also learn how to survey the material and item that has good quality, but the price is affordable.

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## CHAPTER 4

### RESULTS AND ANALYSIS

#### 4.1 INTRODUCTION

Prepared By Ng Wei Hong

This chapter incorporates the Baby Washing Machine's data and analysis, as well as its material calculations. This data and analysis are vital to the project's success in meeting its objectives and scope. This information suggests that the materials testing was successful. After gathering all information, we examine every possibility in order to make it faultless. Each test was performed carefully and follows all procedures of prudent use.

#### 4.2 FINDING OF THE PROJECT

##### 4.2.1 ACHIEVEMENT OF THE FIRST OBJECTIVE

Our first objective was to design a mini washing machine that can automatically pump water into the machine to a certain level and exclude the water from the machine while the cycle changed from wash to rinse. This objective has been achieved by installing the water level sensor behind the machine and the water pump in the inlet water valve. Besides that, an A/C Retractor was installed beside the outlet water valve by connecting the rubber band and spring. Both of them have worked successfully based on the tests performed in Figure below.

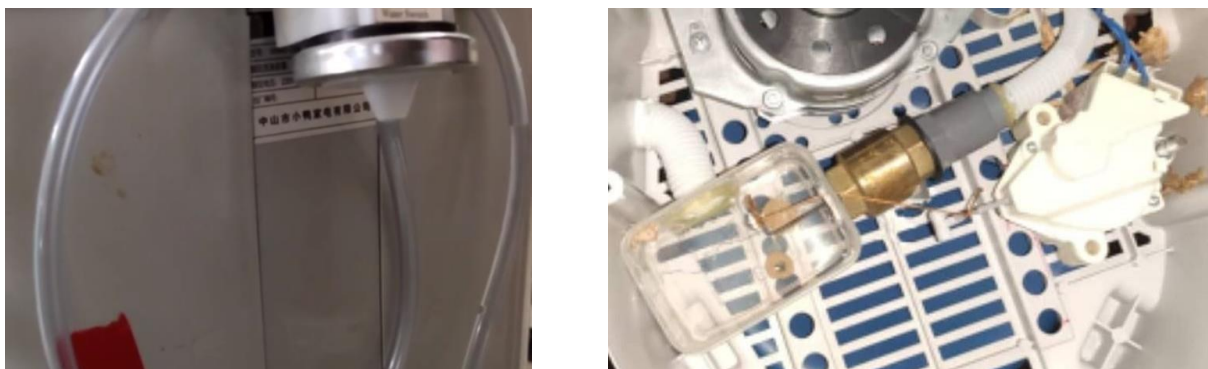


Figure 4.2.1

#### 4.2.2 ACHIEVEMENT OF THE SECOND OBJECTIVE

Our second objective was to develop an Auto Soap Parking device and a control panel that can connect and command all the components. We have Chosen PCB Board as our control panel and auto soap parking was created by using a timer water pump. This was evidenced by our success in running all the components by just clicking on PCB Board and all the process was successfully commanded by PCB Board automatically.



Figure 4.2.2

#### 4.2.3 ACHIEVEMENT OF THE THIRD OBJECTIVE

Our third objective was to develop a Baby Washing Machine Prototype model and test the functionality of the Baby Washing Machine where the testing is also done by a mini washing machine in the market. We performed the testing by recording their data such as washing performance, noise, cleanliness, and so on.

### 4.3 Result of Comparison for Baby Washing Machine and Mini Washing Machine

The functionality has been compared between Baby Washing Machine and Mini Washing Machine. Both of the washing machines were tested for washing performance, total running time, RPM, noise, total water consumption, and also some differences have been recorded for the result record. Any entries are written and recorded for the use of the results record by being interpreted through testing.

	<b>Baby Washing Machine</b>	<b>Mini Washing Machine</b>
<b>Power Usage</b>	240 V	220 V
<b>RPM</b>	300	60
<b>Total Running Time (Whole Cycle)</b>	20-25 Minutes	20 Minutes
<b>Washing Program</b>	Wash, Rinse, Spin	Wash
<b>Detergent Usage (Per Cycle)</b>	8 g	15 g
<b>Noise</b>	40dB	60dB
<b>Total Water Consumption</b>	10 L	8 L
<b>Washing Performance (Cleanliness)</b>	98%	70%
<b>Weight</b>	4.5 Kg	4.5 Kg
<b>Load Capacity</b>	4 Kg	3.5 kg
<b>Drainage Method</b>	Auto	Manual
<b>Product Size</b>	33cm*30cm*43.2cm	33cm*30cm*49cm
<b>Control Method</b>	Automatic	Manual
<b>Time Controlled</b>	PCB Board	Timer
<b>Type of Motor</b>	A/C Motor	D/C Motor

4.3 Result of

#### 4.4 END OF PRODUCT



After the testing process is done, our final product has finally been constructed where it comes with 1 Set of Baby Washing Machine. The Baby Washing Machine set was included an inlet water pipe. Users can just install the inlet water pipe by twisting it to the inlet water valve and connecting with the water source.

## **4.5 ADVANTAGE AND DISADVANTAGE**

The results of every project have their own set of benefits and drawbacks. The benefits will serve the people's life easier and provide more leisure time to relax their mind. However, the drawbacks must need to be modified in the future so that the projects that we have done may develop an extremely efficient product for every user.

Baby Washing Machine has a lot of advantages that can help user's life become more efficient. The goal of this project was to equip PCB Board that enables users to wash their laundry by pressing two buttons. This is because, with the auto soap parking, users only need to replace the soap when it runs out. The innovativeness of this project is taking advantage of the PCB Board that allows users to run the process of wash, rinse, spin by clicking one button.

Apart from the benefits, this initiative has a disadvantage that we must overcome in the future for the higher cause. We would like to add on a heating element to Baby Washing Machine. This is because we would like to design a washing machine that can totally dry after all the washing procedure has been done. So that consumer can directly wear their garments after being finished washed by Baby Washing Machine without drying under the sunshine.



## 4.6 CHAPTER'S SUMMARY

The analysis and findings have been done as a conclusion for this chapter. There are many pros to using a Baby Washing Machine, but there are also some drawbacks. As a result, the difficulties are viewed as opportunities for future generations to better and develop, as well as to broaden their understanding of the project we have completed. To evaluate the peak performance of the Baby Washing Machine, multiple test run was conducted, and it is discovered that it is strong and rigid to use.

4

## **CHAPTER 5**

### **CONCLUSION AND SUGGESTIONS**

#### **5.1 INTRODUCTION**

For this project, all of the data and information gathered, the analysis is carried out to see how users react to this product. The decision is made based on all the results obtained from the experiments conducted and the discussion is about the objectives of the study and also recommendations for the study conducted. In addition, conclusions have been drawn for this experiment our group has learned that washing machine plays a vital role in our daily life. It makes work easy and comfortable. Also, it saves huge time and energy. Due to modern inventions, washing machines are available in various types of various features.

#### **5.2 DISCUSSION**

We have found that the weaknesses found during the planning and implementation when creating a 'Baby Washing Machine' need proper improvement so that the weaknesses during the creation of this 'Baby Washing Machine' can teach us all in planning, implementing, and creating something.

Furthermore, we need to set a date to plan the project we want to create in advance to ensure enough time to prepare in advance because a good project requires a long plan to be produced. In addition, we also need to produce an eco-electricity project so that electricity consumption is not too much. In addition, we also need to use lightweight components so that our project is not too heavy.

### 5.3 SUGGESTIONS

Through my analysis of our product Baby Washing Machine, there are some recommendations that we can do to make it more extraordinary than the washing machine that sells in the market. Firstly, we can make the washing machine cheaper compared to the mini washing machine but at the same time, we keep the quality of the product (such as we change the plastic box to a hard plastic box). Secondly, we can make it lighter and more portable that can be carried (add wheel). Third, we can make it a trio functional washing machine that can wash, rinse, and dry. Fourth, we can make it more eye-catching by making it a more interesting design. To add the fourth point are by making more design, style, colour, shapes, and sort of it to make it suitable for all of the types of houses.

Lastly, we can make the washing machine is babies friendly by using no friction and corrosion material and products that can get hazards and injury. entertainment products. This may happen because they might already have a security system in their house. Although they are not as much as those who want safety products. We also knew that if we did this project there will be a big demand for our project because it is very low cost and easy to install and operate.

## **5.4. SUMMARY**

In conclusion, this project is made to make it easier for people. It is very fast and easy. This machine is safe to use the ability to wash clothes using our product. The project also can bring anywhere light. So, the user does not have to worry about the way it is used because we have provided a way for this machine to be used better. Our product is more suitable for use by teenagers who are still studying and single adults. This is because they are easier to take anywhere such as to university and so on without using a long time and a lot of manpower.

In addition, our products can also be suitable for houses with small spaces such as apartments, flats, etc. This is because this product is unique. After all, it has a good size with full systems of normal washing machine, design and safety to be placed in a house that has a small space and can facilitate the user. People should realize this sooner and should start to get involved in this matter. To conclude, it all depends on the hands of the consumers, you can choose Baby Washing Machine to make your life easier.

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