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# Design and Fabrication of Dry Chili Seed Extraction Machine

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**Abstract:** The application of automatic device or machine in the preparation of food based product in the household or small or medium scale food industries is truly essential. Among the frequent works done by housewife or chefs at the restaurant is cutting the dried chilies in preparing the appropriate menu's or dishes for lunch, dinner or for food business purposes. An idea of creating and developing suitable device or machine to facilitate the process of cutting chilies has come through and therefore a prototype named Dry Chili Seed Extraction Machine was built and created. The machine is used by housewives or chefs whom normally need to prepare food for their family and customers. The main purpose of this dries chilies seed separator machine is to save the time used to separate the seeds from the chili. Using existing methods, it may take longer time to prepare it and can cause irritation to the skin. Based on the existing method or technique used to separate the seeds, this device also able to cut the chilies into several pieces. With customization and improvement to the device, it is capable to solve the problem of difficulty to separate the seed with different size of chili. As the capability of the machine is increase, the more quality of the product can be produced. This project will help housewives or chef to save more time and prevent injury.

**Keywords:** Chili, Design, Aluminium, Motor, Extraction, Machine

## 1. Introduction

Chilies are considered as the most important ingredients in the Malaysian cooking. The spiciness in the cooking came from the chilies which is used widely in all races traditional recipe. Housewives and chef usually use the chili paste where the dried chilies are processed into paste in their cooking. The problem is that the process to extracting the seeds of dried chilies may cause some problem and effect to the users such as hand injuries possibilities due to the application knife or scissors. Plus, the chilies also can cause hand burning and effect to the skin.

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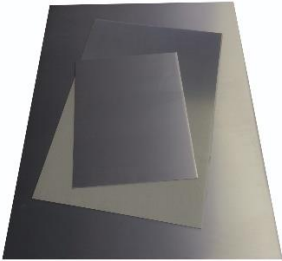

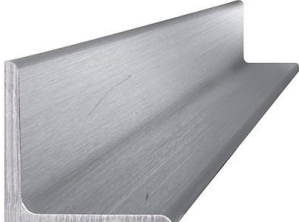
This situation is focused to the housewives and restaurant worker which is exposed to the direct effect of chilly burning. Moreover, for the restaurant which is use lot of chilies per day, extracting the seeds of dried chilies need time consuming because the traditional way to extract the seeds is low production but take longer time and the result can sometimes be disappointing. So, the aim of this project is to design and produce seed extraction machine which will help housewives and restaurant worker in preparing dishes. This machine also can prevent hand from chilies burning. Besides that, to design and fabricate such machine so that human effort is reduce and increase the productivity of seeds extraction.

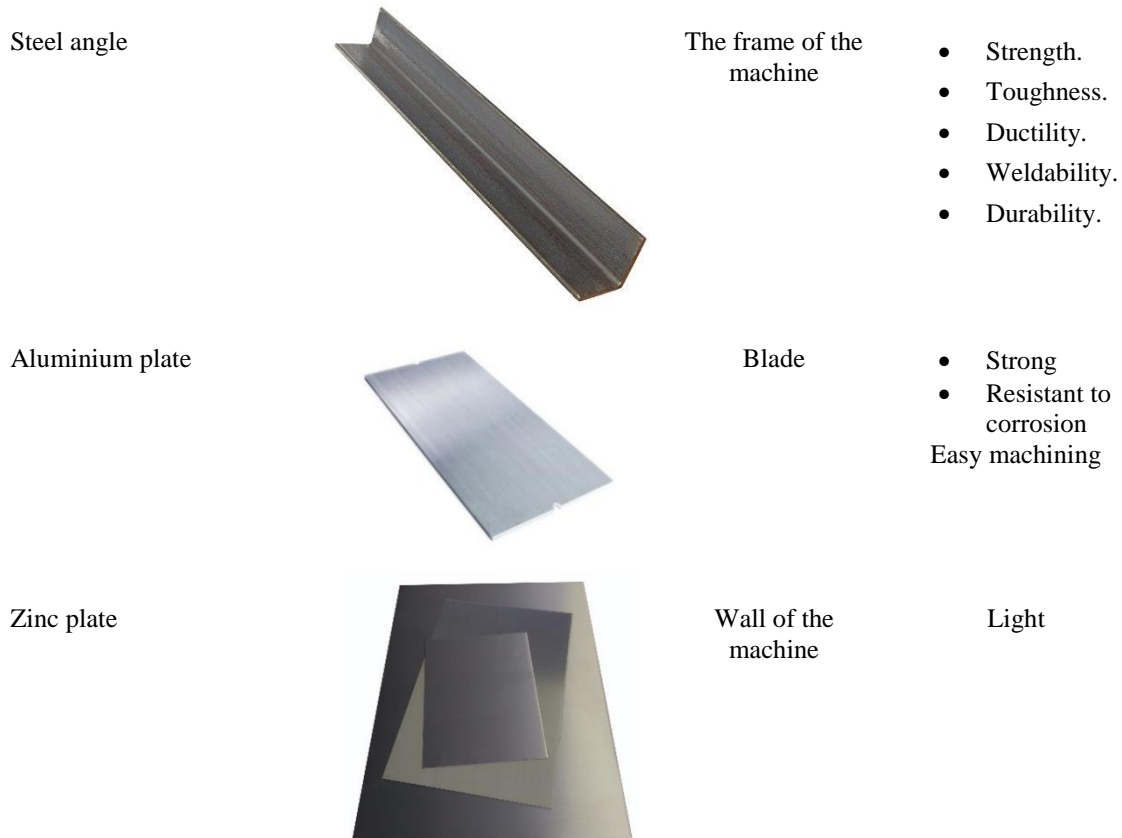
## 2. Materials and Methods

### 2.1 Materials

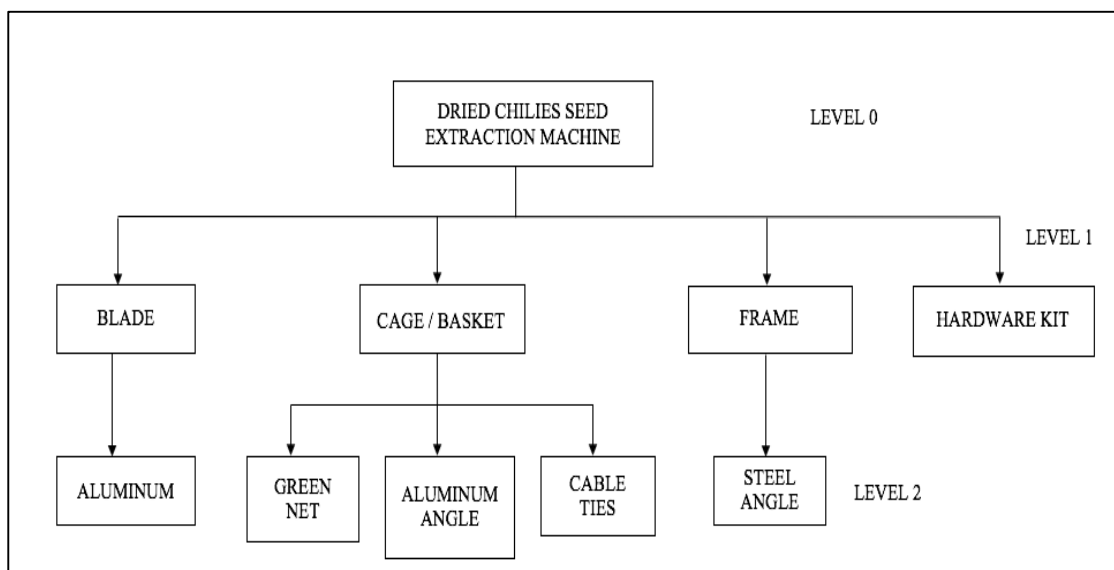
The main material used in the making of this machine is aluminum. The characteristic of the material which is high resistant to corrosion, high strength and easy machining are the reason why aluminum is chosen among the other materials. Plus, aluminum is a recommended material for food related machine.

**Table 1: List of Material**

| Name            | Picture                                                                             | Component Involved    | Selection Factor                                                                                            |
|-----------------|-------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------|
| Aluminium plate |   | Blade                 | <ul style="list-style-type: none"> <li>• Strong</li> <li>• Resistant to corrosion</li> </ul> Easy machining |
| Zinc plate      |  | Wall of the machine   | Light                                                                                                       |
| Green net       |  | Cage / basket         | Seeds can pass through the holes                                                                            |
| Aluminium angle |  | The frame of the cage | <ul style="list-style-type: none"> <li>• Strong</li> <li>• Resistant to corrosion</li> </ul> Easy machining |



The concept of operating system for the project is the AC motor will move the blade inside the body of the project when it is switch on. To cut the dried chilli into segments, the hob is usually being used in the device [1], while to remove seed, shaker or blade like spinner may be utilized [2]. An electrical motor such as brushed DC motor, AC motor, induction motor or synchronous motor [3] may be used to convert electrical into mechanical energy. A coupling device between two shafts used to transmit power [4].



**Figure 1: List of material on the machine**

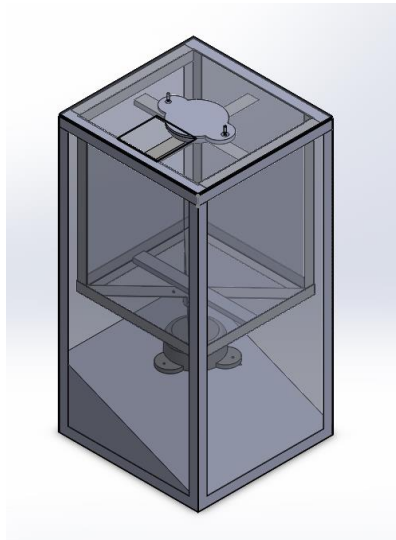
## 2.2 Design Process

Design process is the most important phase in manufacturing a product. In the designing process of dried chilies seed machine, convert the tedious manual method of cutting, boiling and squeezing to mechanical and electrical method. The purpose is to cut down the operating cost and decreases the time consume when doing the process. Some survey also made to see on the tendency of consumers in cooking using chilies with seed or without seeds [5].

The main part of this machine is the blades which play an important role to cut the chilies into parts. After that, the process is continuing with the making of the frame of the machine. The machine provides external and internal support to the machine. The size of the frame is determined by taking much aspect into consideration. That include the size of the cage, radiator fan motor and blades. The process continues with the making of the cage. The function of the cage is as the place where the dried chilies are collected and stir to separate the seeds after being cut into parts. The preliminary stage of any project is the conceptual design phase. The early sketches of the machine are important to generate ideas and making future improvements

## 2.3 Design Selection

After going thru all the phases needed, the final design was chosen after considering several factors. The factors that need to be considered when selecting design are functionality, safety, material selection and size [6].



**Figure 2: Final design of Dried Chilies Seed Extraction Machine**

This design was chosen based on the above factors. This is because the design fulfilled almost all the factors that has been considered and comparison already made with other inventors [7]. It has the size that are suitable for small scale usage and light for the consumer. With almost all the parts of the machine covered, the user can run the machine at ease. Most important, it also can fully functional as the dried chilies seed separator.

## 3. Results and Discussion

The project was successfully done and produced a machine called Dried Chilies Seed Extraction Machine through the ideas of conceptual design and transformed into real prototype machine. The project uses some used component such as blender motor and motor controller. The total project cost a total of RM 350 in components and cost of testing the product. The machine produced works well in

extracting the dried chilies seed. It is a simple mechanism where when the switch is turn on, the blender motor will rotate the blades. For the dried chilies to be slices into parts, the user need to insert the dried chilies manually through the hopper. As mention in the objective, the product is fully designed to separate the seeds from the dried chilies.



**Figure 3: The Inside Component after Fabricate**

### 3.1 Product Comparison

To ensure that the product has successfully produced, several comparisons has been made to identify the advantage and disadvantage of the product. After taking several factors, below is the list of advantage and disadvantage of the product that has been analyze.

**Table 2: Comparison between the existing product and Dried Chilies Seed Extraction Machine**

| Dried Chilies Seed Separator Machine<br>(Existing Product) | Dried Chilies Seed Extraction Machine<br>(PSM Product) |
|------------------------------------------------------------|--------------------------------------------------------|
|                                                            |                                                        |

- Large
- Heavy
- Expansive
- Suitable for industrial production

- Small
- Light
- Cheap
- Suitable for housewives and restaurant worker



- Can be risky, cause injury
- Cause irritation to the skins
- Time consuming
- Low productivity



- Not risky as the machine do the slicing and separating
- High productivity

### 3.2 Product Testing

The machine has been tested several times to test the performance and efficiency. Dried chilies were used as the subject of the test. The machine has been through several testing sessions. The testing is made based on the ability of the machine to fully function when the extraction seed process is in progress. The aspect including speed during slicing process, the strength of the machine, durability during continuous operation and efficiency of the machine has been taken in to account during the testing session.

**Table 3: Result of testing using dried chilies**

| Type of chili | Testing Phase | Results |
|---------------|---------------|---------|
| Dried Chilies | Test 1        | 45.00%  |
|               | Test 2        | 53.00%  |
|               | Test 3        | 65.00%  |

The data is collected by observing the percentage of the seeds that able to be removed by the machine. The comparison has been made between the manual removal of seeds and the one using the machine. When using traditional method, the percentage of the seeds removed from the dried chilies are up to 91%. Compare to the chilies that use machine, it managed to remove up to 65% of the seeds.

The analysis also included on how many grams the machine can process in a minute. To collect the data, comparison made between using the machine and manually process dried chilies in a minute. The result showed the machine capable to process 50 grams of dried chilies in a minute. It is a lot better than the traditional method as the method only managed to get 2 to 3 pieces of dried chilies in a minute.

The torque and speed of the motor is very important in this project. The torque and speed of the motor must be high. This is because, it requires higher torque to withstand the force exerted when the blade is in contact with the dried chilies. In addition, the speed must be high in order to beat the time taken when doing it manually.

### **3.3 Summary of Prototype Machine**

The Dried Chilies Seed Extraction Machine is completely fabricated. In this project, the technique such as welding, grinding, complete electrical circuit and fabricating were used in building and fabricating the machine. However, some problem occurred during the completion of the project. At first, initial decision is by using radiator's motor but later need to be changed into blender's motor. This is because the radiator's motor cannot cut the chilies properly. Its rotation are not strong as blender motor. If they were used in the machine, the seeds cannot be separate with chilies as good as the ability of blender' motor.

Besides, in the first attempt, the motor controller were not add in the machine. But, when the project is fully fabricated and testing has been conducted to the machine, it is notice that the lower blade make loud noise and strong vibrate. Therefore other option has been chosen by placing the motor controller to reduce it rotation and indirectly can reduce the loud noise and vibrate. The blade at the lower part of the machine rotate slower than the blade on the top.

Moreover, another problem encountered when it fail to join the green net with the aluminum frame using riveting to make the cage. The green net is not properly attached to the aluminum frame as it kept loose from its grip when the machine is running. Therefore, cable ties were used to join the green net and the aluminum frame.

The product itself has certain limitation for the operational system. The ideal weight of the dried chilies is 350 grams for the machine to works efficiently. The cage of the machine can support up to 350 grams of dried chilies at a time. For different types of chilies such as bell pepper, to use this machine is impossible as the hopper is only fit the size of dried chilies. Plus, large types of pepper/chilies are not the scope of the project. In extraction process, the machine can eliminate up to 55% of the seeds, otherwise the consumer need to sieve them until fully removed.

## **4. Conclusion**

The project has been successfully completed and achieved the objective. However, throughout the process of completion, several obstacles faced but anyhow all of the obstacles were overcome and the prototype of the project fabricated and completed successfully. Dried Chilies Seed Extraction Machine was designed to benefits the user and consumer in terms of safety, productivity and other aspects. Besides that, the concept of this project is to minimize the labour work when working on dried chilies. This project targeted housewives and restaurant worker as consumer. Most of the machines available in the market are not suitable for small and medium use. Thus, as the objective achieved, the device works. The device gives many advantages to the user as it is easy to control the slicing and extracting process. After undergoes several testing sessions, there are some improvement that can be implemented



to the machine. The improvement is for the machine to improve and works flawlessly in the future. It does not indicate that the machine is a failure because the project has achieved its objective and the machine works efficiently. Below is some recommendation for the machine, such as decrease the distance between the blades or add more blades on the motor so that more seeds can be removing. Next, the motor should have high torque to withstand the load of the cage and the force exerted during the slicing process. Lastly, one of the walls needs to add a clear acrylic glass (Perspex) so that the process inside the machine can be monitor.

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