



## Design and Development of Shallots Skin Peeler Machine

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**Abstract:** Shallot has been used as one of the ingredients in Malaysian food. One of the step in shallot preparation before start cooking is peeling the shallot skin. However, peeling process become more complicated and take longer time if cook in more quantity. Therefore, this project is intended to overcome the stated problem by designing and developing a Shallots Skin Peeler Machine. The designed machine has following a basic design process started from identification of needs, conceptual design, embodiment design and detail design. Meanwhile, for proof-of-concept testing, the proposed machine concept has been developed to test the functionality and capability. Several activities have been included in discussion. As a summary, the Shallots Skin Peeler Machine has been successfully designed and verified based on the proof-of-concept testing. This machine can be used for peeling the shallot skin with a good condition and suitable for home or individual purpose and also can do bigger task if the size of the machine is scaling up depend on the required shallot's quantity.

**Keywords:** Shallot, product design, design for functionality

### 1. Introduction

Shallots have been a popular food for many centuries. Today, they are valued for their flavor, aroma and taste, being prepared domestically or forming raw materials for a variety of food processors. They are probably the most universally used vegetables in most countries. Shallots skin peeling is an essential step in producing many of the shallot products [1-3].

Technically, shallot's skin remover can be categorized as a food processing machine. The design of shallot's skin remover is to simplify the way to peel off the shallot's skin. The core business of the Resistance Capture is about to fabricate the machine that will contribute the easy way in food industry that require a large amount of shallot's skin to be peeled off as the essential routine. The production of the shallot is present in considerable within the short period of time by using the Shallot's Skin Remover. Basically the current status of the Resistance Capture are focuses in fried shallot and spice

industry that required substantial of shallot production [4-5]. Thus, the fabrication of the shallot's skin peeler machine in order to produce a bunch amount of shallot is presented.





The inventions of onion peeler are widely used in industry. However, for shallot's skin remover is infrequently introduced due to the size specification of shallots is small compare to the onion. As to fulfill the requirement, Resistance Capture takes an initiative to invent the new feature design of the shallot's skin remover into industry of food processing. The idea of shallot's skin remover is close towards the onion's skin peeler machine with the combination of the fowl depilatory machine concept [5-6].

#### 1.1 Existing Product Identification

Benchmarking is the process of designing new products or upgrades to current ones. This process can sometimes involve reverse engineering which is taking apart competitors' products

to find strengths and weaknesses and also one of continuous process to find and implement best practices that will lead to superior performance. As the definition implies, benchmarking is a process that will improve quality and productivity[6-8]. Table 1 shows the benchmarking between the commercial products.




**Table 1 – Benchmarking between products**

No	Specification	Product 1	Product 2	Product 3	Product 4
1.	Manufacturing	Shadong, China	Beijing, China	Henan, China	Henan, China
2.	Name of product	Maoyuan	Bidragon	Furui	Newin
3.	Photo				
4.	Material	201 or 304 Stainless steel	201 or 304 Stainless steel	201 or 304 Stainless steel	201 or 304 Stainless steel
5.	Machine Size	1060x660x980	2100x830x1800	2100x830x1800	600x600x800
6.	Power	1.5kW	1.5-2.2Kw	150W	100W
7.	Power source	Electric power	Electric power	Electric power	Electric power
8.	Operation	Automatic	Automatic	Automatic	Automatic
9.	Capacity	Peeling rate: 96%	0.5-2.5Tons/Hour	500-700kg/h	
10.	Moveable Mechanism.	Static	Wheel	Wheel	Static
11.	No. of Operator	One	Two	One	One
12.	Covering body	Yes	Yes	Yes	Yes
13.	Screw	Yes	Yes	Yes	Yes
14.	Switch	Yes	Yes	Yes	Yes
15.	Weight		250Kg-330Kg	248kg	40kg

**1.2 Problem of Existing Product**

Table 2 shows the problem that occurs from the existing products that has been in market.

**Table 2 – Problem of Existing Products**

No	Product	Problem
1.		<ul style="list-style-type: none"> <li>Some of the onion skins are not fully cleaning</li> <li>Machines are complex in construction and heavy in weight</li> </ul>
2.		<ul style="list-style-type: none"> <li>High usage of power supply</li> <li>Expensive machine</li> <li>High cost of maintenance</li> </ul>
3.		<ul style="list-style-type: none"> <li>High usage of power supply</li> <li>Expensive machine</li> <li>High cost of maintenance</li> </ul>

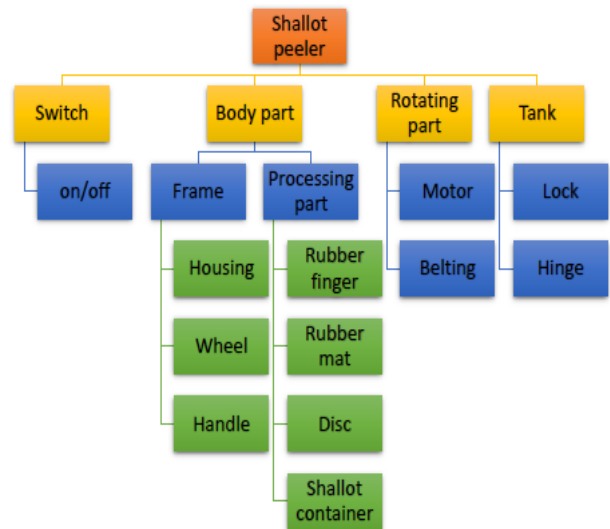


**2. Proposed Design of Shallots Skin Peeler Machine**

**2.1 Conceptual Design**

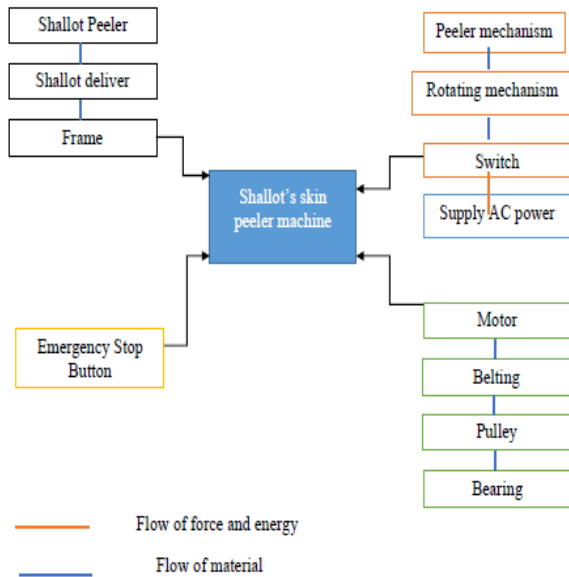
**2.2.1 Component decomposition and function analysis**

By referring the hierarchical structure of parts and subassemblies as shown in Figure 1 and 2, we can clearly see that shallot peeler machine is formed with the combination of four main components which are switch, body part, rotating part and tank. The main component which is switch will give the function to start and stop the operation of the machine. The body part gives two sub element which are frame that include housing, wheel and handle with processing part which include rubber finger, rubber mat, disc, and shallot container for the final product. The operation of this machine is depending on the rotating part that connected on motor and belting. Component that include in tank are its lock and hinge.



**Fig. 1 – Component Decomposition of Shallots Skin Peeler Machine**





**Fig. 4 – Schematic diagram of Shallots Skin Peeler Machine**

**2.2.2 Product Configuration**

The set of predefined components that acting as interface (connected) in given predefined way, and the assembly of selection component known as configuration design. Technically, configuration design indicates the establish shape and general dimension of the components. The component used in generic sense involve special purpose which is designed and manufactured for a specific purpose due to specific product line. Next, standard part which is manufactured routinely without depending on the particular product. Furthermore, the generic sense of standard assembly that is an assembly or subassembly that required generic function and manufactured routinely. Normally, a part is can be categorize due to its geometric features such as holes, slots, walls, ribs, projections, fillets and chamfer. The feature arrangement includes both location and orientation of geometric features.

Standard component literally is an individual part, fabricate in thousands or millions with the equivalent specification such as size, weight, material selection and others. According to Table 4 indicate the standard component for shallot skin's peeler that has been clarified. Standard module is standardizing, frequently interchangeable system component or construction designed for simple assembly or flexible used. Based on Table 4 indicates the standard module used in shallot skin's peeler. Special purpose component that is limited in operation to the acquisition of specific function. Normally, special purpose components are subsidiary components. Regarding to Table 4 showed the special purpose component of shallot skin's peeler.

**Table 4 – List of standard and special parts**

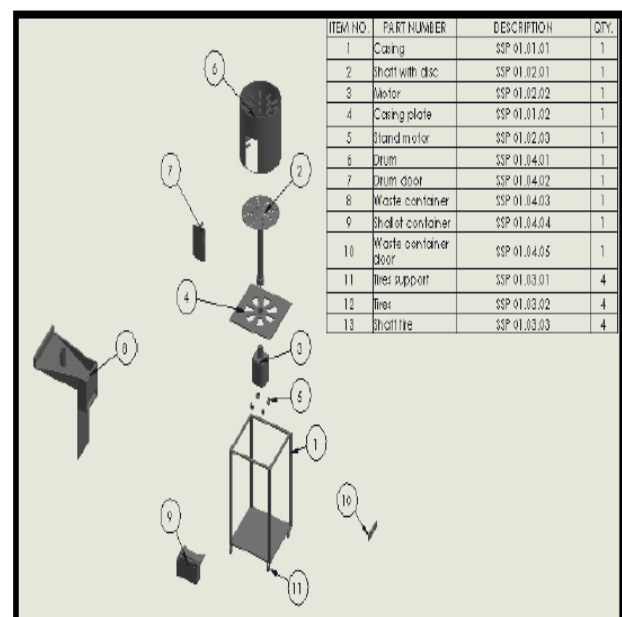
Standard Components	Quantity
Electric motor	1
Standard Modules	Quantity
Chassis	1
Drum	1
Disc	1

Wheel	4
Special purpose part	Quantity
Shaft	1

**2.3 Detail Design**

**2.2.1 Detail Drawing**

Detail drawing is a drawing of a part giving a complete and exact description of its form, dimensions, and construction. In our project we are more concern in the detail drawing of part that we fabricated by ourselves. In our product, has been divided into several parts, of which the mainly part is the casing, drum, tires, motor, container, and others. Casing, plate and tires are the main support of this product. Overall, the shallot skin peeler has around 13 pieces of parts as shown in Figure 5. The detail drawing of parts as illustrated from next pages.



**Fig. 5 – Exploded view of Shallots Skin Peeler Machine**

Assembly drawing was a detail drawing that show how all of the parts interact of mate to each other to form a useful machine. It will allow us to identify the exact connection between each part. A complete assembly drawing is presentation of the product or structure put together, showing all parts in their operational positions. An assembly drawing is needed for all products or inventions that have more than one part. These drawings list all parts and sub-assemblies that make the final product. An assembly working drawing includes all the necessary information for structure on one drawing. This requires providing adequate orthographic views together with dimensions. Figure 6 shows the Shallots Skin Peeler had been assembled from 13 parts component by using SolidWorks software.





**Fig. 8 – Welding process**

### 3.2.4 Drilling Process

In order to make holes, drilling process was used as represents in Figure 9. The dimension of the hole was referred to the diameter of the rubber finger.

### 3.2.5 Painting Process

In the final step of making the prototype for product concept test, the assembled prototype was painted based intended color of the future using water color sprays. The colors were used included red color for the drum door and black color for the whole of drum.



**Fig. 9 – Drilling process**

## 3.2 Prototyping (Assemble) Process Time

In term of establishing the prototype, manufacturing processes which has involved in this project can be divided into two major parts; fabrication process and assembly process. The prototype fabricating process takes around 2 weeks to complete. Effective time management is highly demand in this stages by make sure that prototype of the project can be done in time. At this stages, all the materials are combined together to form the prototype of the shallot's skin peeler machine.

### 3.2.1 Fabrication Process

Fabrication process was conducted by building three main parts of the prototype; Main body, disc and drum. Processes involved in fabrication process consist of cutting

process, drilling process, grinding process, surface finishing process, welding process and painting process.

### 3.2.2 Assembly Process

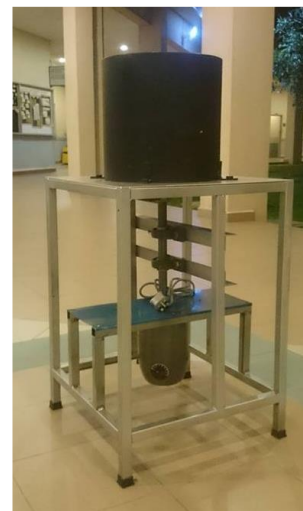
Assembly process takes place as the last stage of the manufacturing process by combining all manufactured part together as one final product. Manufactured parts of the project such as drum and disc were attached together. Next, installation of additional equipment such as rubber finger, door for the shallots out from the drum and industrial fan motor were preceded by producing the complete shallot's skin peeler machine. Table 5 shows the process duration.

**Table 5 – Process duration**

Process	Duration (Hour)
Measurement, cutting, drilling and grinding process	10
Welding process	8
Surface finishing process	4
Painting process	4
Main part assemble process	4
Final assemble process	2

## 3.3 Final Prototype

Besides that, there is great uncertainty as to whether a new will actually do what is desired. New design often has unexpected problems. A prototype is often used as part of the product design process to allow engineers and designers the ability to explore design alternatives, test theories and confirm performance prior to starting production of a new product. Figure 10 shows the product prototype of our project.



**Fig. 10 – Prototype of Shallots Skin Peeler Machine**

## 4. Conclusion

Conceptual design plays important role in fabrication of shallot's skin peeler because overall performance of the design is depending on it. In order to assure the design part, follow the standard qualification, the chosen of material is required. For further development, the study of product material is considered due to improves life time and overall performance of shallot's skin peeler machine.

The production rate for shallot skin peeler is increase within short period of time, thus the objective of the project is successfully achieved. The purpose of the product invention is to helps small food industry to increase their productivity by introducing the machine well function to peel the shallot.

In a nutshell, as mention in previous, the objective of the project is achieved. The shallot is able to peel off within less than five minutes about one kilogram of shallot weight. Hence the objective stated is compulsory fulfilling as productivity of shallot is increase with short period of time. Besides, high degree of team work for each of group member play significant role in order to accomplish the task given. According to this project plenty of knowledge regarding to engineering design discovered by understanding the whole design process from the conceptual design into real manufactured product.

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