

The Design and Development of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

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Abstract:

The main objective of the development of semi-automated paste filling machine was to provide the simple filling mechanism into pouch pack for spicy shrimp paste (sambal belacan). The spicy shrimp paste contains chilly seed and flakes often stuck during filling process whilst using the current and normal filling machine. Hence, semi-automated paste filling machine for spicy shrimp paste was developed and customized for Dapur Ibu Food Industry. The machine is 70cm height X 35cm width X 83cm length. The development of this machine attached with volume sensor, speed sensor and extruder (co-injection) to push the spicy shrimp paste through the special fabricated nozzle and avoid clotting during the process of filling into the pouch pack. The co-extrusion could create the outer envelope and an auxiliary system for injection a filling. The machine also has sensor for speed depends on the speed of the operator holding the pouch pack. Quality control for food hygienic whilst the operation is ongoing is being controlled and monitored.

Article History

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I. INTRODUCTION

Spicy shrimp paste or sambal belacan is usually the enhancer for Malays, Indian and Chinese in Malaysia when ones to eat lunch or dinner, or any Asian countries such as Indonesia, Singapore or Brunei [4][5]. Spicy shrimp paste is often taken and dipped in with any fresh vegetables [7][8].

Many kampung people or village people will never missed eating lunch or dinner with spicy shrimp paste or sambal belacan [7][8]. Spicy shrimp paste is prepared fresh with a mixture of variety chili peppers, onions, garlicks, and lime juice, some even put in rice vinegar, ginger, shallot, scallion and sugar to make it more delicious [7][8]. All the ingredients will be add it together with a slice of shrimp pounded block that have been fried or burn to kill its pungent smell as well as to release its aroma of belacan [7][8]. Then all of these ingredients will be ground using a mortar till fine mash with flakes of chili and chili seed. And now its ready to eat either with rice or fresh vegetables [2][5].

II. PROBLEM STATEMENT

Currently the company (Dapur Ibu Food Industry) manually filled the spicy shrimp paste using ladle with cuboid scoop. They are not using any machine due to the current machine always stuck with the chili seed and flakes. The hygienic process of filling the spicy shrimp paste into the pouch is not controlled [1][3][6]. Although, they have filled in the spicy shrimp paste into the pouch and the pouch is sealed and have undergone pasteurized process, however the hygienic process is still questionable. The manual filling process is effecting with low production, higher time consumption and incur cost to pay more worker to fill the spicy shrimp paste into the pouch manually [4].

With this problem, the researchers came out with the design and development of semi-automated paste filling machine for spicy shrimp paste

whereby is to solve the current problem (or manually filling process) and give an alternative solution for filling mechanism from manual filling operation with the development of semi-automated paste filling machine for spicy shrimp paste.

III. THE OBJECTIVE

The main objective of the development of semi-automated paste filling machine for spicy shrimp paste is to solve problem from manual filling operation using more labors or workers to less worker in using a semi-automated paste-filling machine for spicy shrimp paste. This is not only will increase the production of spicy shrimp paste but also to increase the hygienic process and reduce time consuming of spicy shrimp paste.

IV. MANUAL OPERATION METHOD VS NEW DEVELOPMENT OF SEMI-AUTOMATED PASTE FILLING MACHINE FOR SPICY SHRIMP PASTE

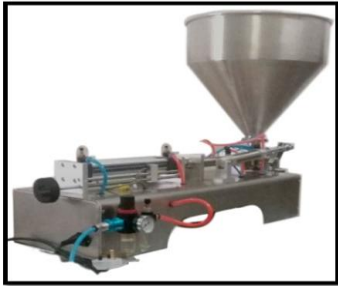
A. Manual Operation Method



Figure 1: Ladle and “Sambal Belacan” pouch

The workers need to manually scoop the spicy shrimp paste @ sambal belacan using the ladle into the pouch.

B. The Development of New Semi-Automated Paste Filling Machine for Spicy Shrimp Paste



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Figure 2: Side (Angle) view of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

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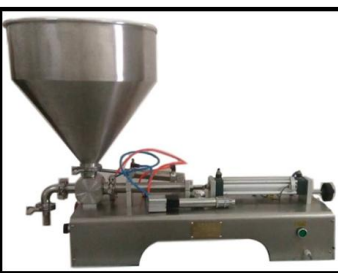


Figure 3: Left and right view of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste



Figure 4: Back and front view of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste



Figure 4: Back and front view of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

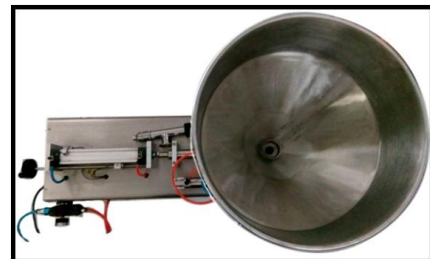


Figure 5: Top view of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

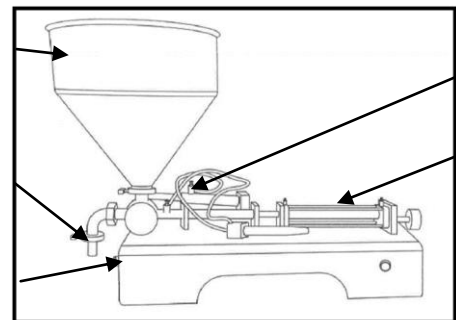


Figure 6: Parts and name of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

Table 1: Parts and Name of the New Development of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

ITEM NO	PARTS NAME	REMARKS
1	Customized nozzle could prevent chili seed and flakes from clotting	
2	Pneumatic pump as provide the pressure to fill the product	
3	Funnel	to fill in the spicy shrimp paste into Funnel 50 Kilogram
4	Volume Sensor (102 ± 2 gms)	
5	Filling Sensor (Following the hand heat sensor of the operator whilst manually filling the product in the pouch)	Filling of one pouch is 3 seconds / 100 gms

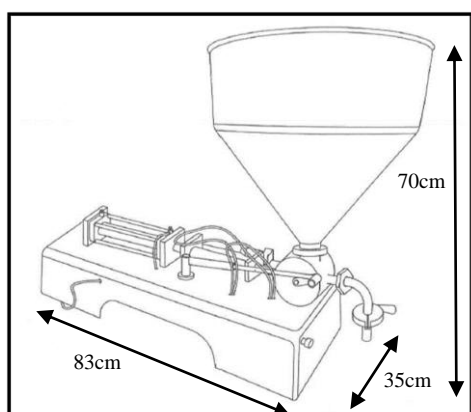


Figure 7: Dimensions of Semi-Automated Paste Filling Machine for Spicy Shrimp Paste

V. THE DESIGN AND DEVELOPMENT OF SEMI-AUTOMATED PASTE FILLING MACHINE FOR SPICY SHRIMP PASTE

The difficulty of pouring spicy shrimp paste into pouch pack is sloved by using a semi-automated filling mechanism intact with extruder in order to overcome the main problem that chili seeds and flakes often stuck during filling processes.

Customized semi-automated filling machine intact with extruder was introduced to overcome chili seeds and flakes often stuck during filling process. The main reason to build together extruder with this filling machine to ensure during filling process the extruder can helps to pressure the spicy shrimp paste thru the special fabricated nozzle and avoid stuck during the process. This filling type also called as co-extrusion or co-injection. Co-extrusion involves the use of an extruder to create the outer envelope and an auxiliary system for injecting a filling.

The spicy shrimp paste production rate is increase with the invention of the semi-automated filling intact with extruder. While the reduction in production time will absolutely have the positive impact on the production rate and increase the hygienic issue.

VI. THE HIGHLIGHTED MACHINE FEATURES

It has been design with compact shape through simple operation for product operation using standard pneumatic parts. Contact part with material using a 316L stainless steel meet the GMPs requirement. Despite from that, filling speed can be adjust around 15 bottles per minute up to 20 bottle with accuracy less than 0.1%. the machine was fully approved by leak-proof system. However, machine full electrical-pneumatic operation thus, working function is stable and rigid component with system operation air pressure 0.5MPa.

VII. STANDARD OPERATION PROCEDURE OF A SEMI-AUTOMATED PASTE FILLING MACHINE FOR SPICY SHRIMP PASTE

1. The prepared spicy shrimp paste is placed in Funnel (3). The funnel could hold up to 50 kilogram of spicy shrimp paste at one time.
2. On the semi-automated paste filling machine.
3. Place the pouch at the nozzle (1).
4. The volume sensor (4) will pump (the pneumatic pump (2) will be working with the pressure to fill the product up to the $100\text{gm} \pm 5\text{gm}$)
5. The filling sensor (5) will sense the head from the workers hand to fill in the spicy shrimp paste
6. The filled pouch with spicy shrimp paste will be place at the sealer immediately to seal the pouch before undergo pasteurization process.

VIII. USEFULNESS AND NOVELTY OF APPLICATION

This mechanism have been used by Dapur Ibu Food Industry based in Sungai Petani, Kedah. The production rate has been increased 100 pouch packs per day to 300-500 pouch packs per day, increase of 200-300%. Time consuming is decreased to 75% from 5 workers and reduce to only 2-person operation. The overall cost of the process is much lower as compared to manual filling operation. The hygienic of the product is being controlled and less exposure to the surrounding.

Novelty and application – the use of sensor at the volume and sensor at the filling are the main novelty invention, and this has increase the production and the filling rate and no more wastage of the product. The special customized

or fabricated nozzle to make sure no more chili seed and chili flake stuck at the filling machine has been solved.

IX. ENVIRONMENTAL AND FRIENDLINESS

This Invention is friendly to the environment due to its invention: Do not use any diesel or other fuel that can produce smoke, Install with the SOP of semi-automated paste filling machine and low volume of sound produced that could prevent from noise pollution.

X. LIMITATION AND SCOPE OF STUDY DEVELOPMENT

The limitation of this development of semi-automated paste filling machine for spicy shrimp paste is meant for Dapur Ibu Food Industry or any other paste filling products industry.

XI. CONCLUSION AND RECOMMENDATION

The design and development of semi-automated paste filling machine for spicy shrimp paste is the best solution to overcome the manual filling operation and upgraded the hygiene procedure to ensure that the spicy shrimp paste is safe to be consume by the customers. The quality and cost of the operation is at the best quality and at the minimum operation cost. Furthermore, this mechanism has been used by Dapur Ibu Food Industry and they are very satisfied with the new mechanism because they have increased their production for more than 200%. Therefore, the improvise mechanism will be done from time to time to make sure the suitability of the operator and quality of the mechanism.

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