



AutoMomo – Rapid Forming Technology

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Abstract: Automation in the food processing industry has become increasingly important to improve productivity, maintain hygiene, and reduce labor dependency. Traditional momo preparation is performed manually, which is time-consuming and requires skilled labor to maintain uniform size and shape. This research focuses on the design and development of an automated momo making machine that integrates multiple motor-driven mechanisms to perform dough feeding, stuffing placement, molding, and product transfer operations. The developed system consists of four motor-controlled mechanisms and a conveyor belt system that performs sequential operations to produce uniformly shaped momos. Experimental trials were conducted at different operating speeds to evaluate the machine's molding efficiency, product damage rate, and production capacity. Results show that the developed machine significantly improves production efficiency while maintaining consistent product quality. The optimum operating speed was determined to be 250 RPM, achieving a molding efficiency of 92% with minimal product damage. The proposed system is suitable for small-scale food industries and commercial kitchens where large-scale momo production is required.

Keywords: Food Processing Automation, Momo Making Machine, Dough Molding Machine, Conveyor System, Mechanical Food Processing.

I. INTRODUCTION

Automation has become an essential component in modern food processing industries to improve productivity and maintain consistent product quality. Many traditional food products such as dumplings, momos, samosas, and stuffed snacks are still prepared manually in restaurants and small-scale food industries. These processes require skilled labor and considerable time to produce large quantities.

Momos are a popular dumpling-type food widely consumed across many Asian countries and increasingly popular in urban food markets. Traditional momo preparation involves multiple steps such as dough flattening, filling placement, folding, sealing, and shaping. These operations are usually performed manually, leading to inconsistencies in size, shape, and filling quantity.

Manual preparation also limits production capacity and increases labor cost. Therefore, automation in momo preparation can significantly improve productivity while ensuring uniform product quality.

This research aims to design and develop an automated momo making machine capable of performing dough feeding, stuffing placement, molding, and product transfer operations automatically using multiple motor-driven mechanisms.

The main objectives of the study include:

- Designing a mechanical system for automated momo preparation
- Developing a multi-motor control mechanism for sequential operation
- Evaluating machine performance through experimental trials
- Determining the optimal operating speed for maximum efficiency

II. LITERATURE REVIEW

Several studies have explored automation in food processing machines for dumplings and stuffed food products. Automated dumpling machines are commonly used in industrial food processing facilities to increase production speed and maintain product uniformity.

Previous research has focused on automated dough sheeting machines, filling dispensers, and molding mechanisms. However, many existing systems are complex and expensive, making them unsuitable for small-scale food vendors and small food industries.

Studies on dumpling production machines show that motor-driven pressing mechanisms combined with conveyor systems can significantly improve productivity and reduce labor requirements. Optimization of motor speed is also critical to prevent excessive pressure that may damage the dough structure.



However, limited research has been conducted on low-cost automated momo making machines suitable for small-scale food production environments.

Therefore, this project focuses on developing a cost-effective mechanical automation system using simple motor-driven mechanisms to improve productivity while maintaining product quality.

III. SYSTEM DESIGN AND COMPONENTS

The automated momo making machine consists of four motor-driven mechanisms and a conveyor belt system that perform sequential operations to produce finished momos.

Main Components

Component	Specification
Frame	Mild steel welded structure
Motor 1	Dough sliding motor (1440 RPM AC Motor)
Motor 2	Stuffing dispensing motor
Motor 3	Dough pressing motor with forward and reverse motion
Motor 4	Transfer motor
Conveyor Belt	Rubber conveyor belt
Transmission System	Belt and pulley mechanism
Control System	Electrical relay control with switches

The machine frame is constructed using mild steel to provide structural stability. The belt and pulley system is used to reduce motor speed and transmit power to the molding mechanism.

IV. WORKING PRINCIPLE

The automated momo making machine operates through five sequential stages controlled by different motors.

Step 1 Dough Feeding

Dough balls are placed in the feeding tray. Motor 1 activates and slides the dough sheet to the mold position where shaping will occur.

Step 2 Stuffing Placement

Motor 2 activates after the dough reaches the mold. The stuffing mechanism places a measured quantity of filling at the center of the dough sheet.

Step 3 Dough Pressing and Molding

Motor 3 rotates in the forward direction to press the dough using a molding plate. The mold folds and seals the dough around the stuffing to form a momo. After pressing, the motor reverses to return to the original position.

Step 4 Momo Transfer

Motor 4 pushes the molded momo onto the conveyor belt. After transferring the product, the motor reverses to prepare for the next operation cycle.

Step 5 Conveyor Movement

The conveyor belt continuously moves forward to transport finished momos to the next stage such as steaming or packaging.

V. EXPERIMENTAL METHODOLOGY

To evaluate the performance of the developed machine, experimental trials were conducted at different pressing speeds.

Trial Conditions:

Batch size = 10 kg dough

Uniform stuffing quantity

Constant conveyor speed

Same dough consistency for all trials

The performance parameters measured include:

- Molding efficiency
- Product damage percentage
- Production time



6 Experimental Results

Trial	Pressing Speed (RPM)	Molding Time (sec)	Efficiency (%)	Damage (%)
T1	150	12	70	2
T2	200	10	85	3
T3	250	8	92	5
T4	300	6	95	8
T5	350	4	96	10

VI. RESULT ANALYSIS

Molding Efficiency

Molding efficiency increased with increasing motor speed. At low speeds, the dough was not fully pressed, leading to incomplete sealing. The highest consistent efficiency was achieved at 250 RPM.

Damage Rate

Product damage increased significantly at speeds above 300 RPM due to excessive mechanical pressure applied by the pressing mold.

Production Time

Production time decreased as the pressing speed increased. However, extremely high speeds resulted in increased product damage.

VII. COMPARISON WITH EXISTING METHODS

Parameter	Manual Method	Semi Automatic	Proposed Machine
Production Rate	5 kg/hour	12 kg/hour	40 kg/hour
Labor Required	4-5 persons	2 persons	1 person
Product Uniformity	Low	Medium	High
Production Time (10 kg)	60 min	30 min	22 min
Operational Cost	High	Medium	Low

The automated machine significantly improves productivity and reduces labor dependency compared to traditional preparation methods.

VIII. OPTIMIZATION OF MACHINE PERFORMANCE

Based on experimental analysis, the optimal pressing speed was determined to be **250 RPM**.

At this speed:

Molding Efficiency = 92%

Damage Percentage = 5%

Production Time = 30 minutes per 10 kg batch

This speed provides the best balance between productivity and product quality.

IX. CONCLUSION

The automated momo making machine developed in this study successfully reduces manual labor and increases production efficiency. The machine integrates four motor-driven mechanisms and a conveyor system to automate the dough feeding, stuffing placement, molding, and transfer operations.

Experimental trials demonstrate that the machine can produce consistent and uniformly shaped momos with improved productivity compared to manual preparation methods. The optimum operating speed was identified as 250 RPM, achieving a molding efficiency of 92% with minimal product damage.

The developed machine is suitable for small-scale food industries, restaurants, and commercial kitchens seeking to increase production capacity while maintaining consistent product quality.

Future improvements may include automated dough feeding systems, programmable control systems, and enhanced stuffing dispensing mechanisms for further performance optimization.



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