Dumpling Maker

EDSGN 100

Section 009

Team 7

Submitted by (from left to right):

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Abstract:

Our design team was created and assigned a project that would take us through the design process and make us work better as a team. This report has many of the steps that we went through in order to complete our assignment. This report will show how we came to our final design.
Table of Contents:

Cover Page.................................................................Elijah Gibbins
Abstract...............................................................Benjamin Myers
Table of Contents................................................Elijah Gibbins
Introduction..........................................................Yuyang Wang
Description of the Design Task.............................Benjamin Myers
Design Approach......................................................Benjamin Myers
The Final Design and its Prototype.........................Benjamin Myers
Engineering Analysis................................................Everyone
Summary and Conclusions.......................................Chris Gantwarg
Acknowledgements.................................................Yuyang Wang
References.............................................................Chris Gantwarg
Introduction

We were assigning this project for our first design project. We were instructed to design and construct a fully or semi-automatic dumpling maker. In order to do so, we needed to follow the design process and work together as a team to create a final result. We were given some constraints and were told to find out what a customer would want in a personal dumpling maker. The main issue we were trying to solve was the lack of a home appliance that could easily and efficiently make dumplings at home.
Description of the Design Task:

1. **Problem Statement**
   People all around the world love dumplings. However, there currently is not a proficient way of making them. Time is being wasted making them by hand, when there is clearly a better way.

2. **Mission Statement**
   The solution to this problem is a mechanical dumpling maker which will produce up to 10 dumplings per minute. Due to its compact design and efficiency, the dumpling maker will reinvent the way people prepare and enjoy their dumplings.

3. **Design Specifications**
   - Fits on kitchen counter
   - Fully or semi-automatic
   - Easy to clean
   - Produces 10 dumplings per minute
Design Approach:

1. Gantt Chart

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<tr>
<td>Problem/Mission</td>
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<td>Design Matrix</td>
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<td>Working Drawings</td>
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<td>Prototype</td>
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<tr>
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</tr>
</tbody>
</table>

2. Customer Needs Assessment
- Easy to use
- Easy to clean
- Durability- capable of being used multiple times without damages
- Efficient
- Cost- reasonable cost that would make the customer believe it is a good investment of their money
- Compact- fit on kitchen counter and can be easily stored
- Weight- does not exceed x amount of weight
- Portability-easy to move

3. Concept Generation

When we generated our designs, first we started by brainstorming some simple ideas and concepts. After we created a list of some of the ideas we liked, we then started make rough sketches of designs we liked. Then we narrowed it down to five design that we then put through a design selection matrix.
4. **Design Selection Matrix**

<table>
<thead>
<tr>
<th>Designs</th>
<th>Categories</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easy to Use</td>
<td>Easy to Clean</td>
<td>Compact</td>
<td>Efficiency</td>
<td>Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conveyor Belt</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Ramp Design</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td></td>
<td><strong>20</strong></td>
</tr>
<tr>
<td>Ramp With Conveyor Belt</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Dough Drop Design</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>&quot;V&quot; Shape Design</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td></td>
<td>14</td>
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</tbody>
</table>

Scale: 1 being the lowest and 5 is the highest

After we put our designs in the matrix, we determined that our “Ramp Design” was the our best option.
The Final Design and Its Prototype:

1. Working Drawlings

This is a Cad assembly of our final design that we made on SolidWorks.

This is the working drawing of the assembly that includes an isometric sketch and three dimensioned views.
2. **Prototype**

This is our prototype that we made in the lab. It is mostly made of cardboard and is not functional. The prototype has a 1:1 scale which means it is the actual design of what the device would be if we actually manufactured it.

3. **Design Features**

Our design includes two rollers that have blade on them in order to cut and shape the dough. The dough then falls onto the ramp, slides down, and then lands on our dumpling clamp. The clamp is under a squeeze bottle that contains the dumpling filling. Once the filling is on the dough, the clamp will fold the dumpling.

4. **Operation Instructions**

The operator will first put the dough in the roller between the blades. Once the dough is in the correct position, the operator will crank the handle. Once the dough falls down the ramp and onto the clamp, squeeze the bottle that contains the filling. Once the desired amount of filling is applied, fold the dumpling clamp. Open the clamp and there will be a finished dumpling ready to cook. There will also be left over dough in the back of the device that can be reused to make more dumplings.
Engineering Analysis:

1. Working Mechanism

To begin the dumpling making process, dough will be inserted through the rollers powered by a crank mechanism connected to the rollers as well as the dumpling folder. The rollers will first flatten and cut the dough simultaneously with the sharp edges carved into the rollers. This creates the circular flat dough. The excess dough is dropped through holes cut in the ramp to be reused. After one of the circle-shaped doughs comes out of the rollers, it will slide down a ramp specially made with low-friction plastic. When the dough reaches the bottom of the ramp, it will fit into a circular slot. Once in the slot, the filling will be dropped onto the center of the dough. Finally, the dough is folded with the mechanism of the crank timed to fold the dough after the filling has been dropped. The dumpling can then be removed. This dumpling maker is capable of producing one dumpling in an average of six seconds.

2. Cost Analysis

<table>
<thead>
<tr>
<th>Material</th>
<th>Usage</th>
<th>Cost</th>
<th>Quantity</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Diameter Conveyor Rollers, aluminum, 1 3/8” diameter, 12” long</td>
<td>To flatten and cut dough into circle shape</td>
<td>$6.67</td>
<td>2</td>
<td>$13.34</td>
</tr>
<tr>
<td>Static-dissipative UHMV Polyethylene, 12” X 12”, 1/8 inch thick</td>
<td>Ramp</td>
<td>$6.88</td>
<td>1</td>
<td>$6.88</td>
</tr>
<tr>
<td>Spoked Plastic Dished Hand Wheels, unthreaded, 5/16” hole</td>
<td>To turn the rollers</td>
<td>$25.33</td>
<td>1</td>
<td>$25.33</td>
</tr>
<tr>
<td>Squeeze Bottle, 3 1/8” diameter, 7 5/8” height</td>
<td>To squeeze the condiments into the center of the dumpling</td>
<td>$9.59</td>
<td>1</td>
<td>$9.59</td>
</tr>
<tr>
<td>6” Manual Dough Press</td>
<td>To fold the dough over and fasten it shut with the condiments enclosed</td>
<td>$3.65</td>
<td>1</td>
<td>$3.65</td>
</tr>
<tr>
<td>High Temperature UHMV Polyethylene, 12” X 12”, 1/8” thick</td>
<td>Structure</td>
<td>$10.33</td>
<td>4</td>
<td>$41.32</td>
</tr>
<tr>
<td>Oval Head Machine Screws, 1/4” diameter</td>
<td>Structure</td>
<td>$5.41</td>
<td>20</td>
<td>$5.41</td>
</tr>
<tr>
<td>Hex Nuts, Alloy 20 Stainless Steel, ¼”-20 diameter</td>
<td>Structure</td>
<td>$1.44</td>
<td>20</td>
<td>$1.44</td>
</tr>
</tbody>
</table>

**Total Cost: $106.96**
Summary and Conclusion:

In conclusion, we created and developed a dumpling maker capable of producing more than ten dumplings per minute. This allows customers to utilize a more efficient and quicker way to make dumplings. The process is easy to understand, with a person inserting dough into the rollers and spinning the crank in order for the dough to be cut and rolled. The only other non-automatic part of our dumpling maker is squeezing of the condiment bottle for the condiments to be released into the middle of the dumpling. The design is also easily portable and dishwasher safe. After assessing our project after its completion, it became clear that we could have used fewer materials to construct the walls of our dumpling maker. Building the dumpling maker would then be less expensive.
References/Acknowledgements:

Small Diameter Conveyor Rollers, aluminum, 1 3/8” diameter, 12” long, $6.67
http://www.mcmaster.com/#standard-rollers-for-conveyors/=11mjzej

Static-dissipative UHMV Polyethylene, 12” X 12”, 1/8 inch thick, $6.88
http://www.mcmaster.com/#uhmw-polyethylene/=11mjujl

Spoked Plastic Dished Hand Wheels, unthreaded, 5/16” hole, $25.33
http://www.mcmaster.com/#hand-wheels/=11mjwn2

Squeeze Bottle, 3 1/8” diameter, 7 5/8” height, $9.59
http://www.mcmaster.com/#squeeze-bottles/=11mk2rh

6” Manual Dough Press, $3.65

Oval Head Machine Screws, 1/4” diameter, $5.41

Hex Nuts, Alloy 20 Stainless Steel, ¼”-20 diameter, $1.44
http://www.mcmaster.com/#hex-nuts/=11mlk3h

High Temperature UHMV Polyethylene, 12” X 12”, 1/8” thick, $10.33
http://www.mcmaster.com/#uhmw-polyethylene/=11mnvze
While I was home a weekend in the beginning of February, I contacted the owner of a local Chinese Restaurant in Wexford, Pennsylvania named “China House”. While speaking with the owner, I asked him how they make and prepare their dumplings. He expressed to me a simple process including a dough cutting roller that cuts dough into the appropriate circle shape, and a device that automatically folds over the dough and sticks the sides together once the condiments are added inside. As a group we attempted to replicate this design as close as possible.