Design Project #2: Dumpling Maker

Group 4

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Submitted to: Xinli Wu
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Abstract

This project is a culmination of our work in the EDEGN 100 course. We are working through the design process as a team. Our common goal is to design and create a prototype of a dumpling maker to the given specifications.

Introduction

This is the second design project for Engineering Design 100 taught by Dr. Xinli Wu. In groups we were assigned to build a semi-automatic or automatic dumpling maker that could be used in either a household or restaurant setting.

Design Task

Problem Statement

Have you ever wanted to make dumpling but never seem to have the time to make as many as you need? Or maybe you cannot seem to get the hang of things?

Mission Statement

This dumpling maker design can produce 10 dumplings per minute and with minimal work. All you have to do is crank the semi-automatic handle to feed in the dough and drop the measured filling. Dough and filling do not need to be pre-measured or shaped, just mix the dough and fillings and you are ready to begin!

Design Specifications

- The dumpling maker should be automatic or semi-automatic.
- The dumpling maker should produce no less than 10 dumplings per minute on average.
- The material cost for the dumpling maker should not exceed $200 unless it can be justified.
- The dumpling maker should be safe as a food processor, easy to maintain, safe to use, and dishwasher safe.
Design Approach

Gantt Chart

Table 1. (below) is a Gantt Chart showing our time and how it was spent.

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering Information</td>
<td>5 days</td>
<td>Thu 7/18/13</td>
<td>Wed 7/24/13</td>
</tr>
<tr>
<td>Design Selection</td>
<td>6 days</td>
<td>Mon 7/22/13</td>
<td>Mon 7/25/13</td>
</tr>
<tr>
<td>Working Drawings</td>
<td>4 days</td>
<td>Wed 7/24/13</td>
<td>Mon 7/25/13</td>
</tr>
<tr>
<td>Constructing Prototype</td>
<td>6 days</td>
<td>Mon 7/25/13</td>
<td>Mon 8/5/13</td>
</tr>
<tr>
<td>Constructing Report</td>
<td>6 days</td>
<td>Mon 7/25/13</td>
<td>Mon 8/5/13</td>
</tr>
</tbody>
</table>

Customer Needs Assessment

The customers need a way to quickly and efficiently produce dumplings with as little hassle as possible. The product should also be of an economic value for optimal results. The cost of production must be under $200 US. The targeted average for the rate of dumpling making is roughly ten dumplings per minute.

Concept Generation

Design Matrix

Table 2. (below) shows our design matrix used in the developmental process.

<table>
<thead>
<tr>
<th>Selection Criteria</th>
<th>A (Reference)</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>0</td>
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<td>0</td>
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<tr>
<td>Creativity/ Innovation</td>
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<td>-</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Working mechanism and operation instructions are clear</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ease of Operation</td>
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<td>0</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Safe to use</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Cost Efficient</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sum +</td>
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<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sum -</td>
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<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sum 0</td>
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<td>4</td>
<td>3</td>
<td>3</td>
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<td>-2</td>
<td>+1</td>
<td>+3</td>
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<tr>
<td>Rank</td>
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<td>3rd</td>
<td>3rd</td>
<td>2nd</td>
<td>1st</td>
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<tr>
<td>Continue?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Selection Matrix

<table>
<thead>
<tr>
<th>Selection Criteria</th>
<th>Weight %</th>
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<th>Weighted Score</th>
<th>Rating</th>
<th>Weighted Score</th>
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</thead>
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<td>3</td>
<td>.45</td>
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<tr>
<td>Creativity/ Innovation</td>
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<td>2</td>
<td>.2</td>
<td>4</td>
<td>.4</td>
</tr>
<tr>
<td>Working mechanism and operation instructions are clear</td>
<td>15</td>
<td>3</td>
<td>.45</td>
<td>3</td>
<td>.45</td>
</tr>
<tr>
<td>Ease of Operation</td>
<td>15</td>
<td>3</td>
<td>.45</td>
<td>3</td>
<td>.45</td>
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<tr>
<td>Safe to use</td>
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<td>.75</td>
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<td>2</td>
<td>.4</td>
<td>3</td>
<td>.6</td>
</tr>
</tbody>
</table>

**Total Score**  
D: 2.7  
E: 3.35  

**Rank**  
D: 2nd  
E: 1st  

**Continue?**  
No  
Yes

Table 3. (above) shows our Selection Matrix used in the selection process.

### The Final Design and its Prototype

#### Working Drawings

**FIG. 1. Design A**

![Design A Diagram]
FIG. 2. Design B

FIG. 3. Design C
FIG. 4. Design D

FIG. 5. Design E
FIG. 6. Dumpling Maker

FIG. 7. Box
FIG. 8. Clamp

FIG. 9. Filling Funnel
Digital Pictures of Prototype and its Scale
Design Features

The design has an adjustable dough rolling station which allows the dough to be rolled into varying thicknesses to accommodate the variance of the fillings. The fillings are measured and will drop based on the adjustable gears. The dough and fillings just need to be prepared and are readily inputted for prep in the machine. Once the dumpling has been filled there is a clamp that cuts, closes, and drops the finished dumplings!

Operation Instructions

Premix your dough and fillings. Put the fillings in the top funnel. Adjust the rollers to the desired thickness and feed the dough in. Crank the handle and wait for your dumplings to drop at the bottom.

Engineering Analysis

Working Mechanism

The dough and fillings need to be premixed. There is a funnel on the top of the mechanism that the fillings can be placed in. The dough needs to be fed through the rollers once the rollers are adjusted to the correct thickness. From here you must simply crank the handle and let the machine dispense the filling, cut and close the dumpling, and drop it.

Cost Analysis

Table 3. (below) shows our expenditures.

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Product Number</th>
<th>Price $</th>
<th>Quantity</th>
<th>Subtotal $</th>
</tr>
</thead>
<tbody>
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<td>Metal Rod</td>
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<tr>
<td>Gears</td>
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<td>4.03</td>
<td>4</td>
<td>16.12</td>
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<tr>
<td>Rollers</td>
<td></td>
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<td>Plastic</td>
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<tr>
<td>Clamp</td>
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<td>12.60</td>
<td>1</td>
<td>12.60</td>
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<tr>
<td><strong>Total Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$93.21</strong></td>
</tr>
</tbody>
</table>
Summary

The four of us worked together to complete the goal of designing and constructing a prototype of a dumpling maker to be used in either a household or restaurant setting. We worked through the design process together and reached our common goal as a team. This report is documentation of the process and our choices along the way. Design Project 2 gave us insight as to how the “real world” might work in the field of engineering and design. We worked with teamwork through all of the processes which are displayed through the Gantt Chart. Overall, Design Project 2 was a good experience and a great way to end the semester in EDSGN100.

Conclusion

We would like to thank Dr. Xinli Wu and our TAs Nick and Yoon for their assistance and generosity. The project helped with furthering our skills in design production. It also required for our team to work together to overcome problems, which prepares us for our future in the engineering field.

References