Introduction to Engineering Design 100
Dumpling Maker

Section 10 Team 3

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Submitted to: Xinli Wu

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http://www.personal.psu.edu/daf5372/Edesign100/edsgn100_sp16_section10team3.pdf.pdf

Abstract

This report created by Damian Faris, Efrain Guzman, Manuel Vazquez, and Matthew Borusso summarizes the approach, analysis, thought process and execution behind the building a portable dumpling maker prototype. All in all, team three as a whole met the design requirements/specifications needed to effectively produce a semi-automatic dumpling maker prototype.

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Damien Faris: Email

Efrain Guzman: Email

Manuel Vazquez: Email

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Introduction

The dumpling maker prototype project was a three week long process that allowed Team 3 as a whole to use the Engineering Design process. Some of the specifications needed to be met were that the dumpling maker needed to be portable, affordable, and easy to maintain/use. Team 3's prototype in the end was semi-automatic, portable, affordable, and easy to take apart to clean. Not only was it easy to disassemble, but it was also durable. Team 3's dumpling maker prototype met all specifications required.

Problem Statement:

The process of making dumplings is a hard task when done manually. This task takes time and money that could be better spent if there were a faster, more efficient way to produce dumplings.

Mission Statement:

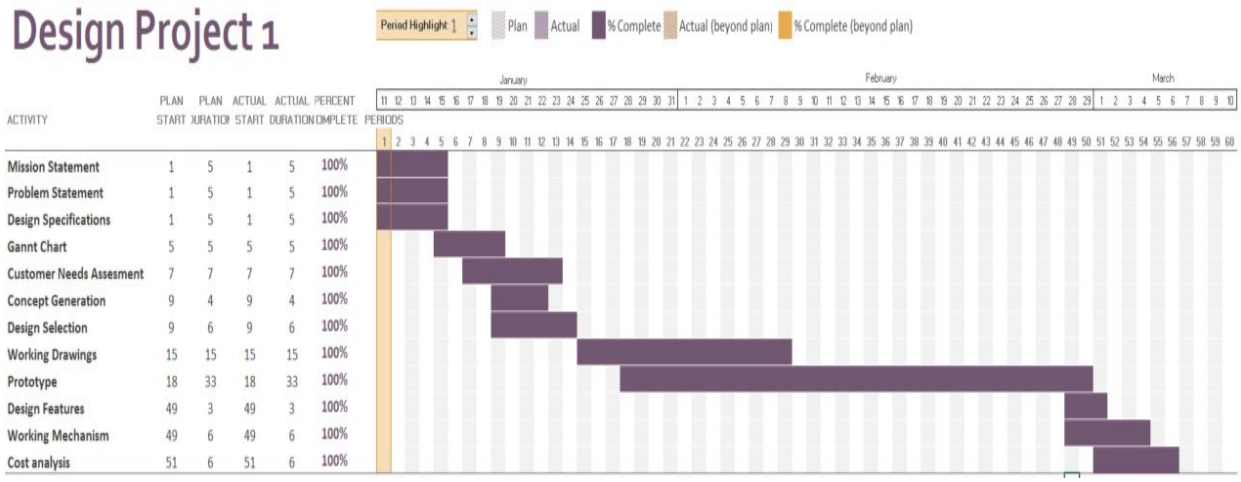
Our mission is to design and build a prototype for a semi-automatic dumpling maker that can be used within the household and restaurants. Our objective is to provide people with a flawless design that is portable, easily cleaned, cost and time efficient, safe to use, and overall a well put together design.

Design Specifications:

- **The dumpling maker design will be automatic or semi-automatic.**
- **The dumpling maker will produce 10 or more dumplings per minute.**
- **The material cost will not exceed $200 per unit.**
- **The dumpling maker will be overall a safe, easily maintained, and dishwasher safe design.**

Design Approach

Project Management- Gantt Chart



ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Mission Statement	1	5	1	5	100%
Problem Statement	1	5	1	5	100%
Design Specifications	1	5	1	5	100%
Gannt Chart	5	5	5	5	100%
Customer Needs Assesment	7	7	7	7	100%
Concept Generation	9	4	9	4	100%
Design Selection	9	6	9	6	100%
Working Drawings	15	15	15	15	100%
Prototype	18	33	18	33	100%
Design Features	49	3	49	3	100%
Working Mechanism	49	6	49	6	100%
Cost analysis	51	6	51	6	100%

Customer Needs Assessment

In order to get an idea of how to design the dumpling maker, we developed the following questions and surveyed eight separate Chinese restaurants to collect information on what key aspects and functions the dumpling maker should have:

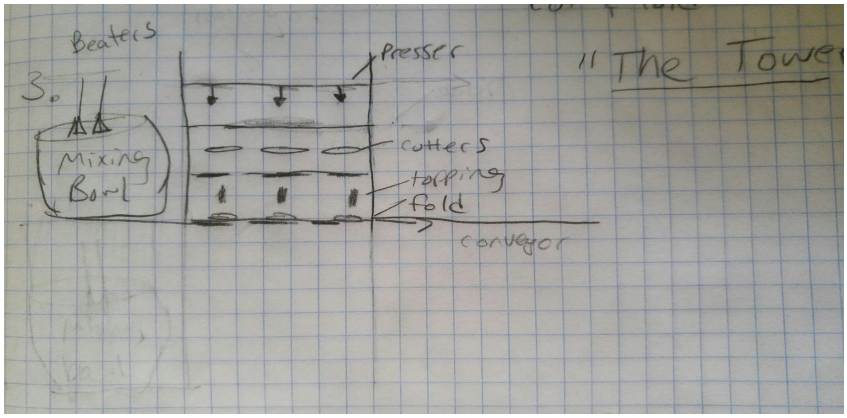
1. Do you make your own dough for the dumplings or do you buy pre-made dough?
2. Would you rather have a more expensive, fully automatic machine, or a cheaper, semi-automatic machine?
3. Would you rather have a larger, more functional machine, or one that is smaller and easier to store?
4. On, average, how fast are you able to make dumplings?
5. How much would you be willing to pay for a dumpling making machine with your desired specifications?

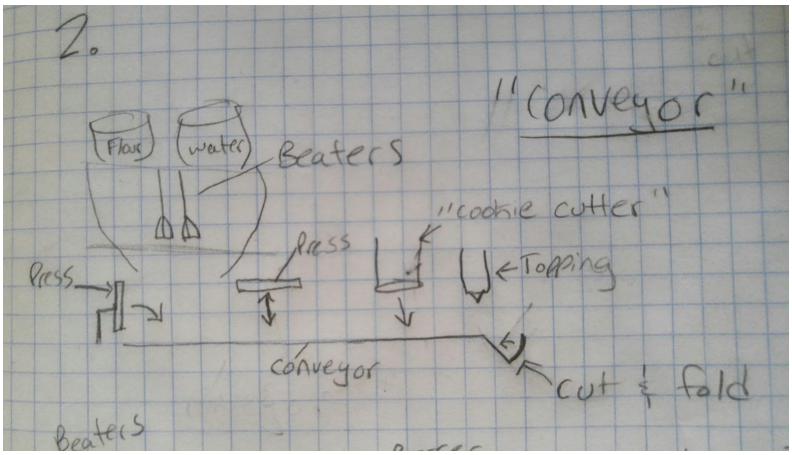
We received the following responses from the surveyed restaurants:

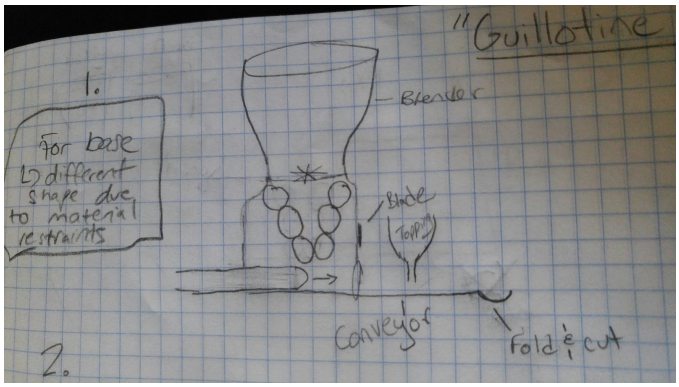
	Dough	Functionality	Size	Dumplings/Minute	Price
Tai Pei Chinese Restaurant	Pre-made	Fully automatic	Larger	12	$250
China Star	Make own	Fully automatic	Larger	10	$200
China Palace	Pre-made	Semi-automatic	Larger	9	$150
Chop Shop	Make own	Semi-automatic	Smaller	6	$120
China Pavilion IV	Make own	Fully automatic	Larger	14	$175
Tea Garden	Make own	Semi-automatic	Smaller	10	$90
Tin's House of Paramus	Pre-made	Semi-automatic	Smaller	9	$100
New Garden	Make own	Fully automatic	Larger	14	$150

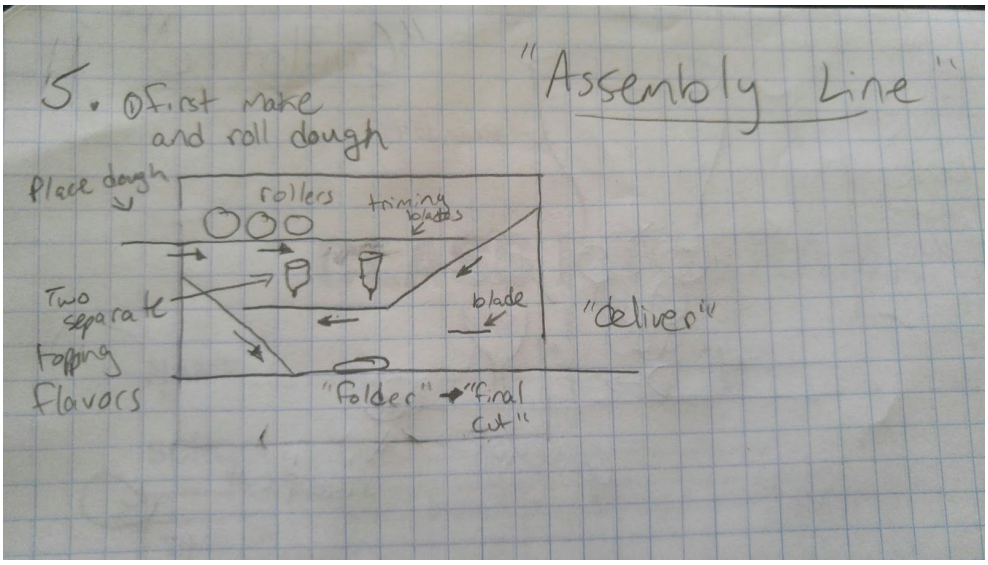
Based on the following results, the team concluded that the ideal design would be a smaller, semi-automatic device that would be easy to dismount and clean. Also, since most of the surveyed restaurants claimed they preferred to make their own dough, the design also had to include a contraption that mixed water, flour, and other raw ingredients to make dough.

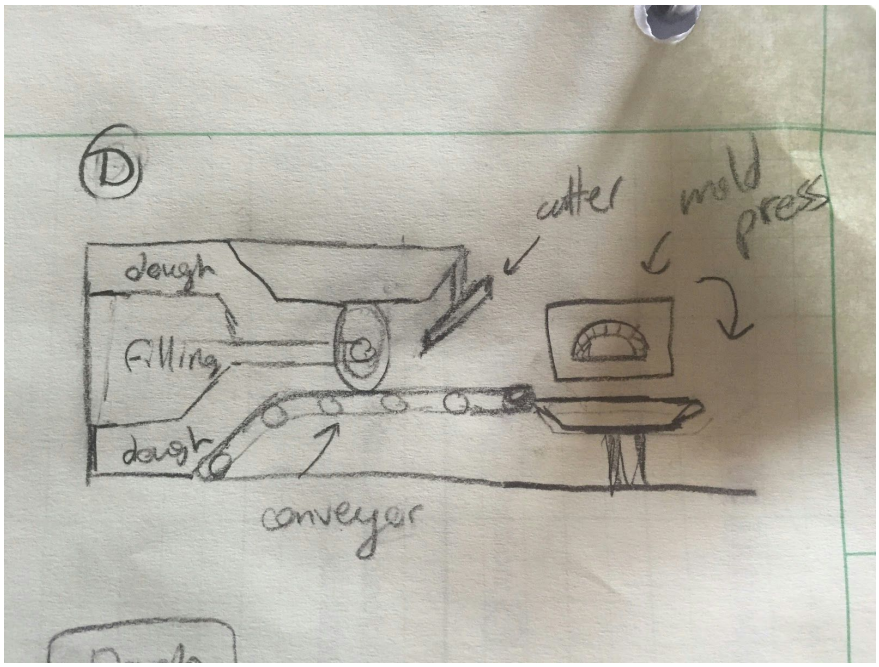
Concept Generation








"Assembly Line"
5. ① First make and roll dough
Place dough
rollers
trimming blades
Two separate topping flavors
blade
"deliver"
"folder"
"final cut"


D
cutter
mold press
dough
filling
dough
conveyor

Design Selection Matrix

Selection Criteria	Guillotine	Conveyor	Reference (Shell)	Assembly Line	Tower
Durability	(+)	(+)	0	0	(+)
Speed	0	(+)	0	(-)	(-)
Neateness	(+)	(-)	0	(-)	(+)
Handling	(-)	(+)	0	0	(-)
Portability	0	(-)	0	(+)	(+)
Cost	0	(-)	0	(+)	(-)
Ease of Manufacture	(+)	0	0	(+)	(-)
Sum +	3	3	0	3	3
Sum 0	3	1	7	2	0
Sum -	1	2	0	2	4
Net Score	2	1	0	1	-1
Rank	1	2	4	3	5
Continue?	Yes	No	Combine	No	No

Final Design and Prototype

Design Features

Some main features of our design included the dough funnel/mixer, dough rollers, dough shooter, dough cutter (knife), conveyor belt, filling funnel, and dumpling folder.

- Dough funnel/mixer: a funnel shaped mixer that mixes the ingredients for the dough (water and flour).
- Dough rollers: flattened the dough to a reasonable thickness for the dumplings.
- Dough shooter: took the flattened dough and pushed it out the opening of our device leading to the conveyor belt where the knife cut it to dumpling size.
- Dough cutter: a knife that sliced the dough being pushed out by the dough shooter (made it to a reasonable rectangular dumpling size).
- Conveyor belt: transports the cut dough to the filling station.
- Filling funnel: a funnel where the fillings of your choice are placed in the center of the rectangular dough.
- Dumpling folder: where the rectangular dough with filling in the center is folded in half to seal the dumpling shape with the filling remaining in the center.

Operation Instructions: Semi-automatic Dumpling Maker

1. Place flour ingredients into funnel mixer on the top of the device.
2. Wait until dumpling dough is pushed through shoot and on conveyor belt.
3. Then add dumpling fillings of your choosing to the filling funnel.
4. Wait until folding session is completed, then cook and enjoy as desired.

Engineering Analysis

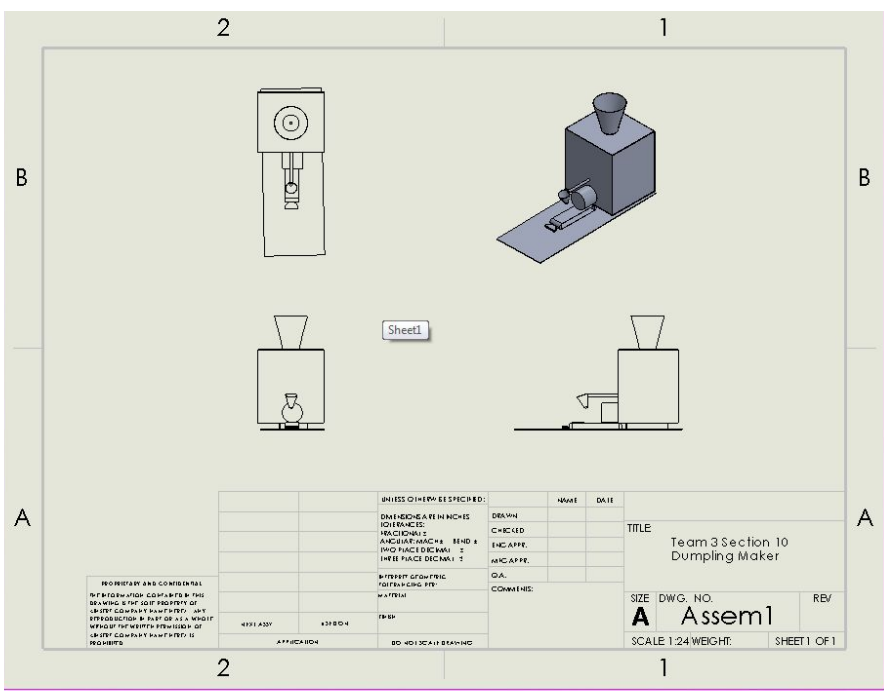
1) Place ingredients needed to make the dough (typically water and flour) into the funnel mixer.

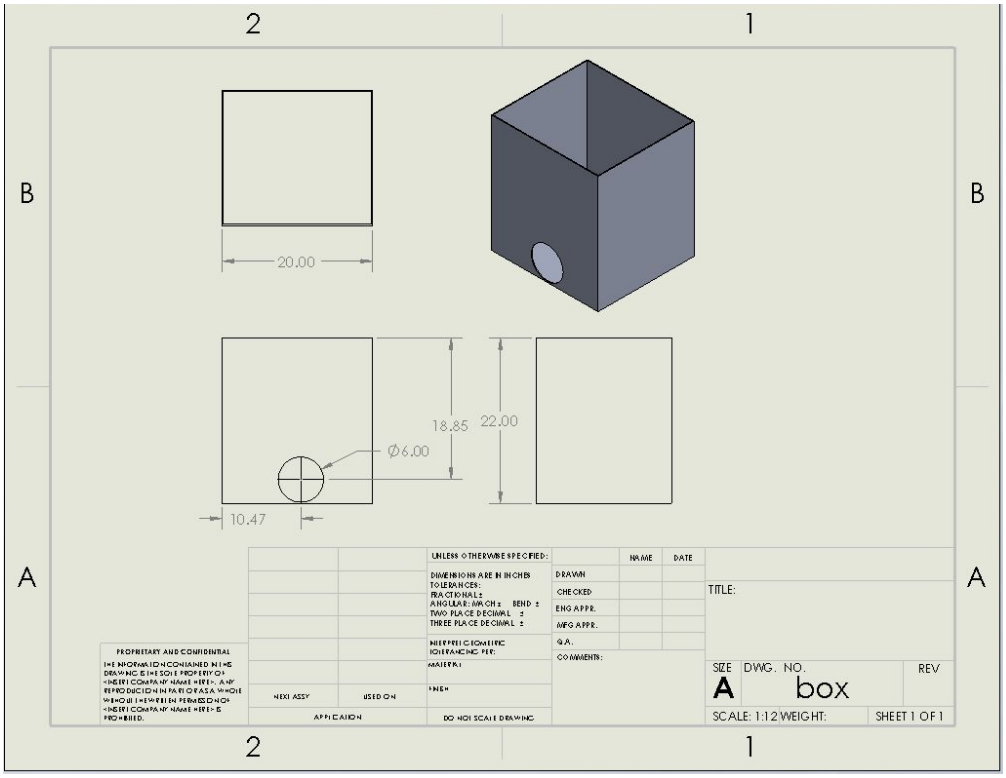
2) Wait for mixer to completely mix and dispense the dough into the rollers beneath. Continue to wait until dough shoot pushes dough out where it will be cut into a rectangular shape.

3) At this point put your desired fillings into filling funnel which will dispense the filling into the dough.

4) Once step three is complete wait for conveyor belt to transport dumpling to folding station, where it will be folded in half and sealed in a dumpling shape.

Working Drawings

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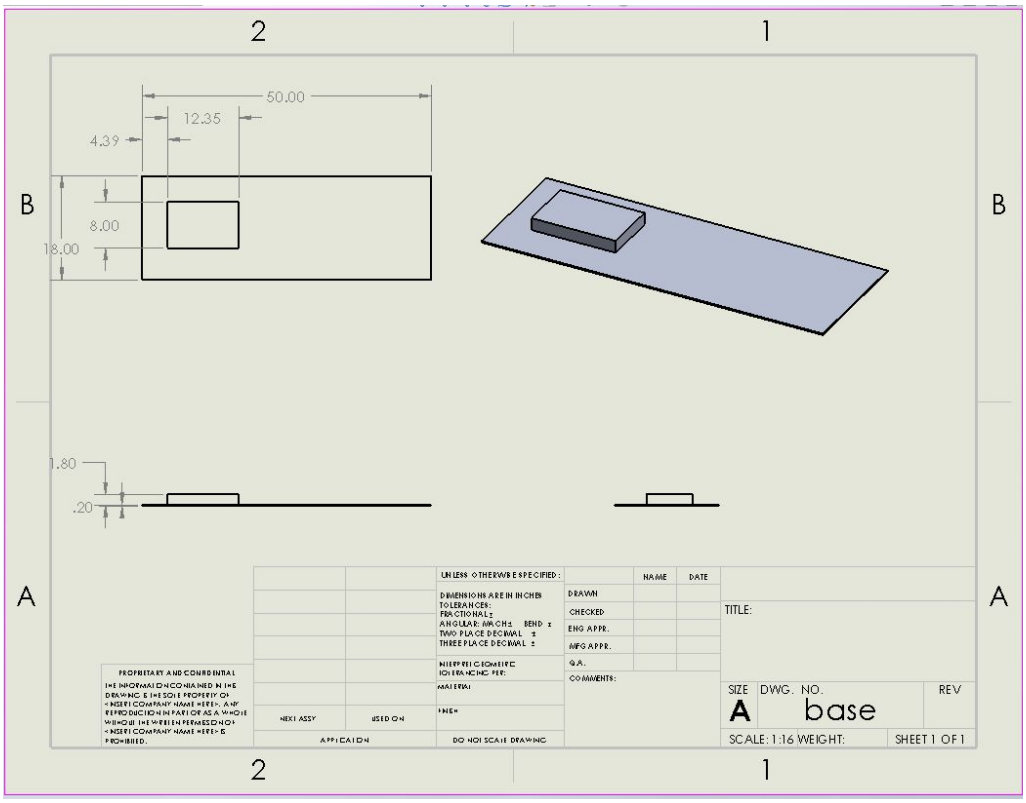
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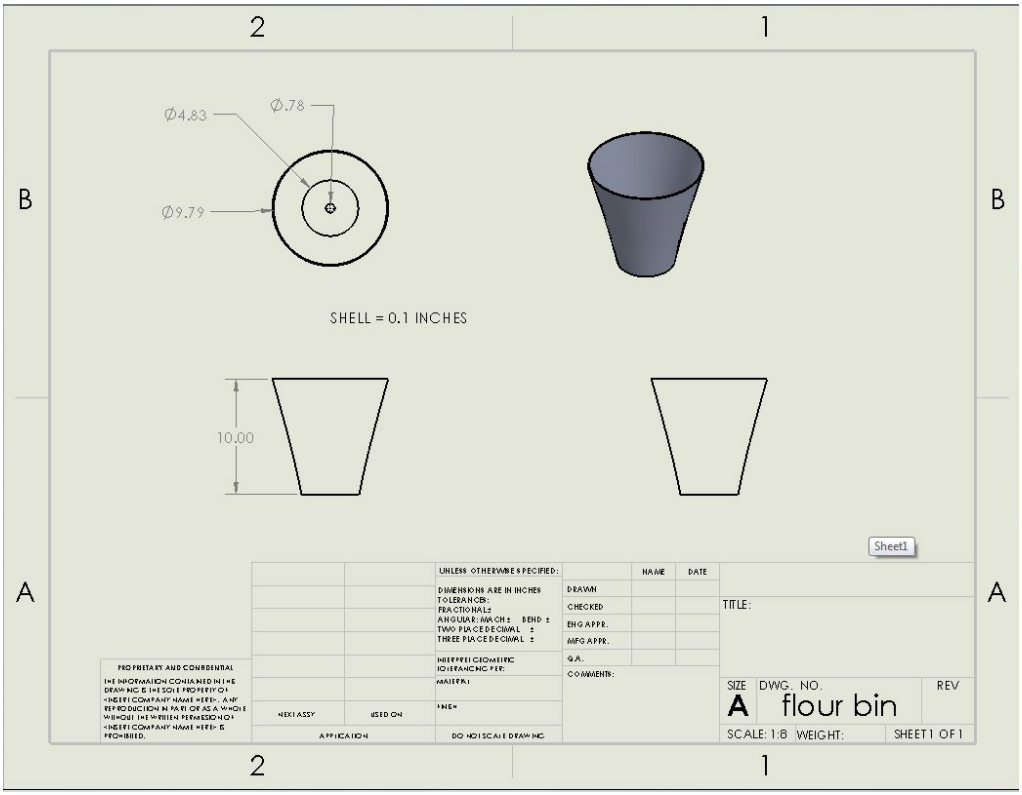
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Cost Analysis

Material	Quantity	Cost per Unit	Total Cost
Blender Glass	1	$9.50	$9.50
Plastic Shell	1	$6.00	$6.00
Plastic Rollers	6	$1.15	$6.90
Plastic "Pusher"	1	$3.97	$3.97
conveyor belt	1	$13.00	$13.00
Plastic Topping Dispenser	1	$2.00	$2.00
Metal Blade	1	$3.50	$3.50
Metal "Folder"	1	$7.38	$7.38
Total Overall			$52.25

Conclusion

During the construction of our dumpling machine, it was necessary to brainstorm any possible complications that could arise during the process. Based on research conducted by our group, it was concluded that customers are more interested in a product, which is easy to use, makes high quality dumplings and can make dumplings by its own. In order to satisfy the customers, our dumpling maker is fully automatic and easy to use. The only thing the customer has to do is to place the ingredients for the dough in the mixer, place their favorite filling in the filling dispenser and turn the machine on. After those steps have been completed, our dumpling maker, which operates on high quality sensors, will go ahead and deliver high quality dumplings. This machine is designed to make about 5 dumplings every 30 seconds, which satisfies our customer needs for fast high quality dumplings.

Initially, our prototype was aimed to be a 1:1 scale, but during our last evaluation it was brought up that there needed to be some changes. Many of our pieces can be reduced in size, this in order to reduce the price of production and make our machine more compact and effective. The first things that should be modified are the dimensions of the machine itself. It is too tall and a little too wide. To accomplish better results, it will be rebuilt to make the width just millimeters wider than the dough rollers, which are located inside the machine. Also, the height will be reduced to where there is only the necessary space for the dough rollers and dough shooter. Next, the shooter itself will be modified; in the prototype, it is way too long and should be reduced in size as well. The new dough shooter should be

long enough to push the dough out of the machine into the conveyor belt, but not longer than that. Also, the conveyor belt is way too long and should be reduced to a size where there is only the sufficient space to have the dough pushed out the machine, to then be filled with the filling and finally cut by the dumpling cutter. Finally, the filling dispenser is way too high up in the air and should be closer to the ground (conveyor belt). This will eliminate any spillage and make the process neater and cleaner. After changes have been done,our dumpling machine will be ready for use and should be of very much help in any dumpling-making environment.

Acknowledgements

The team would like to acknowledge and thank professor Xinli Wu for his cooperation, patience, and guidance throughout the development of the prototype.

Acknowledgements will also go to the YouTube videos that were found on the internet during our initial drafting/ brainstorming phase the design process. Many great ideas were stumbled upon while browsing YouTube, and the team feels the owners of said ideas should be accredited.

Finally, Team 3 would like to thank the owners and staff of the Chinese restaurants that cooperated and were willing to answer our survey questions so that we could develop the most effective prototype possible.

Without the aid of the aforementioned parties, the prototype would not have been as innovative or successful as it resulted to be.

References

Liwin1213. "Dumpling Making Machine." *YouTube*. YouTube, 2 Nov. 2008. Web. 5 Mar. 2016. <https://www.youtube.com/watch?v=-LkEFihPcIY>.

"Dumpling Machine,dumpling Making Machine,samosa Dumpling Machine,automatic Dumpling Maker, Shenyang Jishi Dongfang Machinery Co., 2015. Web. 29 Feb. 2016.

Restaurants Surveyed

Tin's House of Paramus (201-262-5721)

67 E Ridgewood Ave, Paramus, NJ

Tea Garden (201-816-2521)

14 Washington Street, Tenafly, NJ

China Pavilion IV (201-664-7766)

663 Westwood Ave Ste D, Rivervale, NJ

Chop Shop (212-820-0333)

West 25th Street, Chelsea, NY

China Palace (412-687-7423)

5440 Walnut Street, Pittsburgh, PA

Tai Pei Chinese Restaurant (412-781-4131)

1124 Freeport Rd, Pittsburgh, PA

China Star (412-364-9933)

3200 McIntyre Square Dr, Pittsburgh, PA

New Garden (914-288-9788)

17 E Hartsdale Ave, Hartsdale, NY