Final Design Report

Dough-Dispensing Device for Earth Elements Market & Bakery

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Mission Statement

At Perfect Mix Creations, we seek to fix our client's "mixed-up" business headaches. We create innovative solutions through emphasis in product development and communications to make your company more profitable. Our dedication to excellence and professionalism makes us the perfect solution for your next company conundrum.

Problem Statement

Earth Elements Market and Bakery (EEMB) needs a quick and efficient way to create uniform cookies through a device that dispenses dough in a consistent manner. The company also needs new, unified promotional materials to market its products.

Statement of Work and Work Breakdown Structure

At the conclusion of this project's first semester, EEMB and professors presiding over the course received a statement of work from Perfect Mix Creations outlining the deliverables promised upon the project's completion. This document can be found in Appendix A. A work breakdown structure also was created to help visualize all the tasks that must be performed in order to complete this objective. This breakdown has been included in Appendix B.

Competitive Analysis, Research, and Investigations

1. Overview

1.1 Background

April Harrington founded her co-existing entities Earth Elements Farm in 1998 and EEMB in 2007. She initiated the businesses as a solution for eliminating as many chemicals as possible from her food products due to battling cancer for several years prior. Earth Elements' goal since has been building a local food system through preserving locally grown ingredients and providing them to the community. It utilizes crops grown on its own farm as well as those grown by other local farmers to produce quality, wholesome, "Oklahoma authentic" foods. While the company is not considered organic since Ms. Harrington does not wish to go through the hassle of being certified as such, it uses many organically grown ingredients in its products.

Earth Elements produces more than 200 products at any given time based on the availability of its ingredients. One of Earth Elements' major components is creating baked goods, such as spinach balls, meat balls, and cookies, from hand-scooped doughs or mixes. Cookies comprise the largest percentage of these goods, as employees can hand scoop between 900 and 1,200 cookies each day.

1.2 Problem and Mission

Our client has opportunity for cookie-sale growth in existing and emerging markets, however, the company is limited to current production levels by time and labor. Earth Elements employees cannot scoop any more cookies per day than they are currently. Several existing "cookie dispensers" have been tried with limited success. The dispensers either operated more slowly than hand scooping, required an excessive amount of cleaning, created too much waste, or produced inconsistent cookie sizes. The company needs a quick and efficient way to produce uniform cookies through a device that consistently dispenses the same amount of dough. It also needs new or revised promotional materials to help market its increased production.

2. Industry Analysis

2.1 Overview

The Oklahoma-foods industry is comprised of businesses around the state interested in selling and preserving locally grown or raised products. The industry goal either is met by

selling local products directly to the consumer or by processing perishable products into other item, such as baked goods. Our client is involved in both methods through developing her cooperating entities. Earth Elements Farm raises produce and EEMB utilizes that produce to create baked goods, canned goods, and entire entrees.

Earth Elements experienced no expansion in 2009 after seeing an approximate 70 percent growth throughout the previous five years. Although the company remains profitable, its halt in growth is undesirable. Ms. Harrington attributes the company's current condition to the rescession-like economy, saying her customers just aren't buying like they used to. Last year, 32.6 percent of our sponsor's profits came from Oklahoma Food Cooperative (OFC) sales. This leads to the conclusion that the current economy has prevented customers from buying through the cooperative as frequently, and its related sales have dropped. Ms. Harrington said she is not alone in this problem, as Oklahoma-food entities around the state are feeling similar trends in today's economy.

2.2 Regulations and Standards

The government regulates all materials that can come into contact with food. The different regulatory agencies include the United States Department of Agriculture (USDA) and the Code of Federal Regulations (CFR). Several other private organizations write standards and provide safety compliance. Some of these companies include the American National Standards Institute (ANSI), Underwriters Laboratory (UL), and National Sanitation Foundation International (NSF). The NSF provides a product and manufacturer search to help individuals determine whether or not a material is food-safe and what companies produce the materials ("NSF Product and Service Listing"). Standards affecting this project with Earth Elements are 21 CFR 110 and NSF Standards 2, 8, 51, 73, and 763. All materials planned for our use, including stainless steel and plastic, can be made food-safe.

2.3 Gatherings and Publications

A few key gatherings exist for this industry. The OFC's annual meeting is held on January 31 for all member producers. Also, farmers' markets around the state are important to producers marketing and selling their locally grown or raised products. The Oklahoma Farmers' Market Alliance (OFMA) has weekly markets in Tulsa, Collinsville, Edmond, Jenks, Muskogee, Owasso, Bethany, and Stillwater.

Aside from gatherings, publications assist in communicating information between producers and consumers. *Farmers' Market Today* is a significant trade publication in this industry. Since its introduction in 2007, the bimonthly magazine has sought to make small farmers and farmers' markets more successful and profitable. It contains information and stories on what "growers, artisans, and farmers' markets are doing to promote their businesses, reach new customers and develop value-added products" (*Farmers' Market Today*). The *Oklahoma Buy Fresh Buy Local 2009 Green Country Farmers' Market Guide* is another key industry publication. The guide lists markets, by county, throughout northeastern Oklahoma where shoppers can find locally-produced agricultural food and goods ("Buy Fresh Buy Local – Green Country"). "OK Grown" markets, where only produce grown in Oklahoma may be sold, also are noted in the publication. A similar publication in the Frontier Country region around Oklahoma City has yet to emerge, but the new Buy Fresh Buy Local chapter in that area is making plans for future promotions. Should such a publication materialize, it would be an excellent advertising medium for EEMB.

2.4 Resources

Key resources for businesses in the Oklahoma foods industry include local farmers and food-equipment dealers. Local produce and ingredients are available to industry businesses based on the season. Businesses within this industry must create their products around ingredients available at the current time. Materials used for processing (mixers, ovens, storage units, etc.) the local ingredients either are readily available and bought through specialized dealers or acquired second-hand through auctions or the Internet.

3. Customers and Buyers

3.1 Characteristics and Buying Practices

Earth Elements' major target market shops through the OFC, Oklahoma farmers' markets, and health-food-specialty stores. Since the OFC comprises 32.6 percent of Earth Elements' business, most of its customers are located in Oklahoma and have buying and decision-making practices in line with the cooperative's purpose. The OFC only sells products made in Oklahoma and puts emphasis on customers being able to know exactly who grew their product, where their product was grown, and what practices the producer uses (*Oklahoma Food Cooperative*). So, Earth Elements' customers are looking for a locally grown, wholesome food product. Ms. Harrington said a large percentage of the business's customers are repeat buyers

who make orders every month. OFC orders open the first day of the month, and local farmers bring their products to Oklahoma City on the third Thursday. The cooperative's volunteer crew then sorts everything into customer orders, which are shipped to thirty-two pickup sites across the state (*Oklahoma Food Cooperative*). The product amount depends on whether the customer is an individual or business and what can be afforded, while product type depends on seasonal availability.

The prices of the OFC cookies are quite reasonable for buyers as Earth Elements charges $4.00 per dozen for its small cookies. Our project focuses on the smaller cookies since they are the main size sold through the co-op and bring the most sales. Since approximately 30 percent of the company's annual profit or sales come from the OFC, it is important to understand and observe the products with which the company has the best success.

The remaining customer base buys Earth Elements' products through farmers' markets or specialty stores. These buyers are more likely to purchase on a whim than the OFC customers. They browse through the company's products while shopping for several other items at the market or store. They may not be specifically looking for the Earth Elements logo. The cooperative buyers put more thought into their purchases and who they want the items to come from due to the nature of the ordering process. OFC producer, Cordero Farms owner, and EEMB customer Nancy Osborn said she likes the co-op because of the variety it offers, but she would not consider it convenient. So, Earth Elements has to cater to both mind sets.

A new target market for Earth Elements is emerging at Oklahoma State University (OSU) convenience stores and dining locations. For the 2009 fall semester, OSU sales were 6.5 percent of Earth Element's total sales. Terry Baker, director of University Dining at OSU, anticipates the quantity of Earth Elements products to continue increasing. She also said OSU enjoys the partnership with Earth Elements. Earth Elements previously held a contract with the University of Oklahoma (OU) but no longer does business with the university due to a recent management change. Collegiate customers have slightly different demographic and psychographic characteristics than the business's previous target market. The majority are males and females eighteen to twenty-five years old in the process of obtaining college educations. A smaller portion of this audience includes faculty and staff who range from twenty-five to seventy years old. The target market is 78.6 percent Caucasian but also includes black, Asian, American Indian, and other multicultural groups attracted to a university setting ("Oklahoma (OK):

Summary of Oklahoma's Colleges, Universities, and Career Schools). The customers are located in Stillwater, Oklahoma.

The cookies targeted at this market are placed in high-traffic areas around OSU's campus. For example, some are available in a small café on the first floor of the library and others can be found in one of the Classroom buildings, where many classes are held each day. The small cookies are sold in bagged, one-dozen amounts, and the large products are individually wrapped, making them easy for students to grab on the run. The small cookies are sold for $2.75 a bag and each large cookie sells for $1.60. The ability for students to utilize their Bursar accounts and charge the cookies on their student IDs provides added incentive for them to purchase our client's products on campus.

3.2 Market Size

The OFC currently has more than 2,600 members. All members are potential customers for Earth Elements and represent the company's possible growth. Earth Elements currently averages between 300 and 500 orders per month. These numbers leave much of the cooperative population in untouched by the business.

Limited market research currently is available for small businesses like Earth Elements. A survey was conducted during the business's product sampling at OSU's campus on September 29, 2009. The survey questions were created through collaboration between Perfect Mix Creations and Ms. Harrington. The survey was conducted by Ms. Harrington, and the questions were asked verbally while the students sampled. Results are attached in Appendix C.

Consumers and other businesses learn about EEMB's new products through OFC's producer notes. These notes are published on a monthly basis on the cooperative's website, www.oklahomafood.coop, in addition to a company description and full product line. The notes are sent in by member companies each time a new or renovated product is released. The business currently has no publications for new wholesale products. Consumers learn of these products by seeing them on the shelf. OSU's campus is one of the markets Earth Elements is exploring and has a small share. The "college scene" is emerging as a great market possibility and product demand is on the rise. At OSU, Ms. Baker indicated that the demand for Earth Elements products increased after the products' introduction and since has stabilized. She continued by saying all of EEMB's products consistently sell out and quickly are resupplied. Distribution of EEMB products are managed by Urban Agragarian, which delivers to five

campus locations. Deliveries are made weekly or bi-monthly as needed, and the products are placed immediately on the shelves. Cookies, crackers, and granola are among the products provided in this market, but Ms. Baker said other products also would be welcomed by OSU. Our group's machine will aid in the college market's expansion by allowing EEMB to ship more cookies at a time in order to fulfill demand at the least expense.

3.3 Perfect Mix Creations' Market

In order to expand our sponsor's own customer base, Perfect Mix Creations received the challenge of creating cookies through a device that consistently dispenses dough. So, we looked at companies outside of EEMB. After conducting Internet research, we found the market for cookie-dough dispensers currently to include products for large-scaled production or at-home use. Table 1 summarizes the observed companies. Companies for large scale production include Rhodes Kook E King, CMC America Corporation, and Unisource Food Equipment. These companies sell machines that dispense multiple cookies, but they are large, heavy, and contain multiple parts to clean. Companies providing at-home cookie products include Pampered Chef, Russell Hobbs, and BonJour Cookie Factory. These companies either offer a scoop or press that handles one to two batches of cookies. Entities falling between large- and small-scale production currently are underserved by existing products. Small bakeries, catering businesses, and gourmet companies with midsized production have limited space, limited staff, and a large product variety. A small, simple-to-use-and-clean device that still produces many cookies is not available through the companies we researched. Earth Elements Farm has been in contact with other companies similar in size and production that also are interested in a medium-scale dispensing system. The number of companies and their names can not be disclosed at this time.

The intended use of our potential product is to dispense raw cookie dough on to a baking pan in portioned amounts. The device must be simple and able to dispense small portions of any non-solid food product. The basic concept started with a bowl for holding the dough and several holes in the bottom from which the dough will dispense. A press is positioned above the bowl to push dough through the holes. A cutter underneath the bowl then separates the dough into appropriate portions. The device functions using an electric motor to operates the press and cutter. The pan underneath the cutter must be moved manually to catch the portioned dough and create three rows of four cookies.

	Company	Pros	Cons
Large Scale	Kook E King	Dispense Multiple Cookies	Large, Heavy
	CMC America Corp	Fast	Time Consuming
	Unisource Food Equipment	Can Handle a Full Batch	Multiple Parts to Clean
Personal Use	Pampered Chef	Light-Weight	Time Consuming
	Russell Hobbs	Cheap	Holds Small Amount
	BonJour Cookie Factory	Easy to Use	Repetitious

Table 1: Existing Companies

4. Client Company and its Resources

4.1 Management Team

Five main positions exist in Earth Elements' management team. Lisa Weissenbuehler is the office manager, David Weissenbuehler is the packager, Sarah Shore is the sweets baker, Brian Thompson is the yeast baker, and Thelma Jones is the assembler. Three to four other "floater" positions are hired as the need arises.

4.2 Products

Earth Element's product line varies with the seasonal availability of ingredients since it utilizes only locally grown produce from its own farm and other surrounding farms. It produces baked goods, canned goods, jellies, jams, and all-natural body care products. Earth Elements provides over two-hundred different products on average, seventeen of which are cookies. The current product line is attached in Appendix D.

This project focuses on cookie production since it comprises approximately 15 percent of Earth Elements' products and requires the most hand work. Total cookie numbers produced each day depends on employee work hours. Many constraints accompany production both before and after cookies are put in the oven. Before baking, each cookie individually must be hand scooped, leveled, and placed on the cookie sheet. The second constraint is the actual baking. The company's small oven can handle eight-dozen small or four-dozen large cookies, while the large oven can bake twenty-dozen small or ten-dozen large cookies at a time. Once the baking is complete, packaging then becomes the final constraint. Different packaging types require different product amounts and sizes, so cookies must be sorted. Since it would be difficult to improve the second or third constraint without applying large amounts of additional capital, we will focus on simplifying and speeding-up the first step of this process. Our efforts should allow Earth Elements to increase production while keeping labor and input costs constant.

4.3 Inputs and Distributors

Ingredient inputs (wheat, flour, produce, etc.) are acquired both internally from the company's farm as well as from local farmers across the state. Whatever the company does not grow itself, it seeks from other local producers. Inputs not found locally are bought from Braum's or Sam's Club. Earth Elements has purchased used equipment from small estate auctions and other local auctions for its baking and cooking inputs. The different kitchen utilities include mixers, bowls, knives, ice cream scoops, cookie sheets, and ovens.

Earth Elements utilizes a number of different small distributers. The main distributer is Urban Agrarian, which delivers to farmers' markets as well as the OSU campus. Matt Burch then is used to deliver products specifically to small restaurants around the state. Other distributers perform specific deliveries depending on the region in which they are located and the current product line. The going rate charged for delivery is between 2 and 5 percent, but the rate decreases as the shipment volume increases.

Local farmers and distributors are key people in Earth Elements' success as the company depends on local ingredients and consumers to operate its business. The business' key current customers include people at Oklahoma farmers' markets; several restaurants and grocers Mr. Burch delivers to in Guthrie, Oklahoma; Native Roots Market in Norman, Oklahoma; Crescent Market in Nichols Hills, Oklahoma; The Health Food Center in Oklahoma City, Oklahoma; and Oklahoma State University.

4.4 Financing

To determine EEMB's potential for profit, ingredient costs were analyzed. Ingredient costs run around twelve cents per ounce and packaging costs include twenty-five cents per box, seventeen cents per pouch, and three cents per label. Earth Elements currently uses a costing program to calculate its products' costs and profits. Costs are input and the computer generates a cost analysis. An example of how the program is utilized by Earth Elements can be found in Appendix E. Earth Elements' costs for small versus large cookies can be shown for a certain month of production in the bakery. Due to the company's profit margin, it wants to spend between $200 and $500 on the cookie-dough machine.

4.5 Marketing and Promotions

Product marketing is done in-house by Ms. Harrington. She served as a graphic designer for ten years prior to opening Earth Elements. The company currently has existing business

cards, brochures, display signs, and product labels. Earth Elements' website was lost at one point due to a server complication. The current site simply consists of the recovered files posted onto the OFC website. It contains no real design, just a long list of product pictures and prices. The company is open to all suggestions and revisions for a new promotional campaign.

Earth Elements' current logo was designed by Ms. Harrington. She does not want it altered in any way due to the recognition it provides for her products. Ms. Harrington commonly tells potential customers to look for the "green bullet" to find her products. The logo is designed to bring to mind her company's reputation of producing wholesome, Oklahoma-grown products. Ms. Harrington wants her products to be associated with preserving locally grown ingredients and her ultimate goal of building a local food system. The two entities have slightly different logos. The logo utilized by our client for promotional purposes can be seen in Figure 9 on page 35.

5. Competitors and their Resources

Several local businesses compete for customers in Earth Elements' target market. These businesses include Persimmon Hill Farm, 1 Smart Cookie, Dara Marie's Boutique & Bakery, Prairie Thunder Baking Company, Upper Red Fork, Mother's Catering, Granny, The Prairie Gypsies, and Renrick's Family Recipes. Limited market research is available on these small businesses. However, the OFC website and Renee Albers-Nelson, OSU Food and Agricultural Products milling and baking specialist, helped provide information on each competitor. A summarization of the compiled facts is located in Appendix F.

After unsuccessful attempts to locate any further data on Earth Elements' competitors, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis on the current and potential process of baking cookies was conducted. The hand-scooping process can be considered competition as it is how the company's competitors also currently make cookies. Whenever this process is used, a worker can make a maximum of 900 to 1,200 cookies per day. One problem with this process is the fact that the dough is handled more than is ideal. With the new dough dispenser, more cookies can be made in a clean and food-safety-conscious manner. The ability to make more cookies becomes a financial benefit to Earth Elements as it has a growing market for that product.

When conducting a SWOT analysis on the potential and competing processes, weaknesses and opportunities should receive emphasis in analyzing competition. The reason for

this is because they are current internal weaknesses and opportunities in the new device. The current process's biggest weakness is time consumption. When employees spend an entire day making cookies at a rate that could be more efficient, the opportunity costs are high. The opportunity cost is the value of the employees' time. If another way exists to make cookies more quickly with less labor, EEMB can save money on labor expenses

Opportunities also are apparent in the new dough-dispensing system. A major opportunity is the potential for consistent sales to the OSU campus. Earth Elements can send larger amounts of cookies to campus and meet OSU's demands if the company can increase production. Another opportunity available for our client arises from labor opportunities. If it takes less time for the new system to make the same number of cookies, employees can spend that saved time working in other areas around the bakery.

In a complete SWOT analysis, the threats of the new system must be considered. The threat of having this new system could arise in its technology. If the new system fails to make all the cookies the same size, employee may fail to notice due to the enhanced production rate. This is where a strength of the competing process arises. Our client knows all of its currently produced cookies are going to be relatively uniform because employees scoop each cookie individually. This process allows for the human eye to make adjustments to dough volume depending on what is observed as correct.

6. Technical Analysis

6.1 Scientific Literature Review

Current products existing in the market, such as Kook-E-King, are unable to meet Earth Element Farm's needs for several reasons. Cost is the largest issue with the products since the company is a small business and cannot afford the high cost of large and complex machines. Although the larger machines definitely are capable of increasing cookie production at EEMB, they are not an option due to their costs ranging between $1,000 and $9,000. More reasonably priced machines, such as those offered by Pampered Chef, also are not practical because of the number of cookies produced by Earth Elements and the extended amount of time and work required to clean the device. Another issue with smaller dough machines is inconsistency in cookie size. For example, the bench model Kook-E-King produces very large cookies when the hopper is full due to the weight of the dough. However, cookie sizes become smaller and smaller as the hopper empties, according to Ms. Harrington after her use of the machine.

Durability, reliability, maintenance costs, and programs vary widely with the type of machine and company. For example, large companies provide classes to show owners how to operate large, computer-based machines, where as the personal, hand-held gun comes with a simple instruction booklet.

Characteristics of a cookie cutting device are limited only by a person's imagination, but the usefulness of the device is not based solely on the fact that it works. Most patented and workable cookie-cutting machines are not a viable solution for our problem because they are overly complex or difficult to clean. Such machines include components like robotic arms used to scoop portions of dough from the mixing bowl or high pressured streams of water to cut portions off a log of cookie dough. While creative, these options are unnecessarily complex.

When dealing with food processing equipment, issues of keeping the food contaminant-free are a big concern. All parts that come in contact with the food must be smooth, nonporous, and nonabsorbent. Parts like bowls and tubing must not have any square corners. Instead, they must have a radius corner to prevent food from collecting in sharp corners and spoiling. Construction materials must not react with the food and must be corrosion resistant. Acceptable materials include stainless steel, titanium, glass, plastic, and ceramics (Schmidt). Inspection of new food processing equipment designs is done by the Food and Drug Administration (FDA), which follow the Current Good Manufacturing Practices (cGMPs) outlined in the Food, Drug and Cosmetic Act. This act covers bakery personnel, plant and grounds, sanitary facilities and processing. cGMPs are the standard for designing properly cleanable food processing equipment. Food processors can be prosecuted for not following such provisions (Prejean).

6.2 Patent Searches

From September to November of 2009, our team conducted a patent search. We looked online using several different search methods. The different methods we used included keyword searching, reference stemming, and searching by class. We discovered five patents relevant to our proposed cookie machine. Our assessment of each patent is included in Appendix G. Each patent's abstract, claims, and drawing sheets can be found in Appendix H. Our research revealed no patent infringements for our device's design.

6.3 Current Process

Currently at Earth Elements, ingredients are measured, gathered, and blended in a mixing bowl from which the dough then is hand scooped onto a cookie sheet and baked. The only time

the dough is frozen is when a batch has not been completed at the day's end or when it is marketed as frozen dough for home cooking. The current process is diagramed in Figure 1.

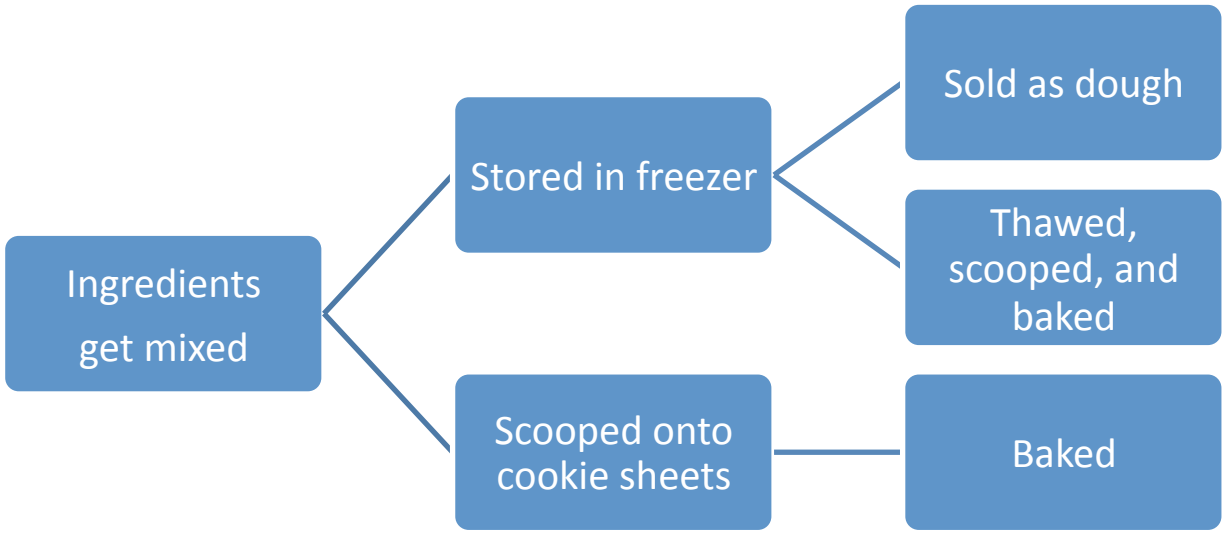

Figure 1: Current Process

6.4 Proposed process

We proposed a device that will dispense dough consistently instead of portioning the dough through manual scooping. After mixing, the dough is transferred to a bowl separate from the mixing bowl and dispensed through several holes in the bottom of the device through use of an electric motor. Dough will be separated by a wire cutter into the correct portions. The uncooked cookies then will be dropped on the baking sheet. The proposed process flow is shown in Figure 2.

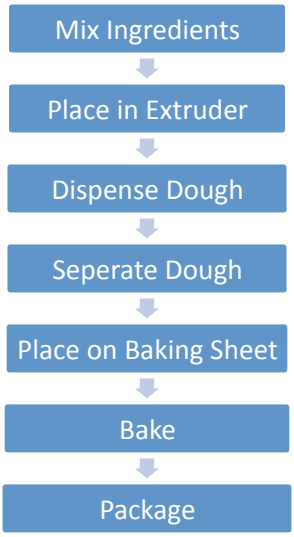

Figure 2: Proposed Process

6.5 Lab Experiments

Experiments soon have been conducted to design Earth Elements' new machine. The project started by testing the viscosity of the cookie dough and the amount of force needed to extrude the dough through various sized holes. Physical testing and data collection included changes in production speed, varying cookie sizes, speed comparison between production with and without the device, easiest input method determination, durability testing, and cleanability.

Three-dimensional CAD drawings have been constructed to illustrate the new system. Animated simulation of the device also has been produced using the CAD software. From a bill of materials, the parts were drafted to scale and sent to OSU's Design and Manufacturing Lab (DML) or Biosystems and Agricultural Engingeering (BAE) shops for fabrication. The CAD drawings can be found in Appendix I.

Environmental, Societal, or Global Impacts

The production of our design is unlikely to affect any global market. The probability of our device taking off and being distributed worldwide is minimal. It is a device for small-sized businesses like Earth Elements, which does, however, lead to environmental and societal impacts.

Ms. Harrington stated several Oklahoma bakeries have expressed an interest in a product like we have created, but we are not allowed to divulge those companies' names at this time. Should our device prove a success, it will make those businesses more profitable. Added profit would allow the companies to expand productivity and maximize their growth. The small-sized companies then either could become a larger-scale entity or could maintain their current size and produce the highest quality products possible. In either case, the expansion of small-sized bakeries around Oklahoma would lead to a definite impact on the area's environment and society. The increased bakery production would cause a higher demand for raw ingredients used by the companies. Area farms and other suppliers of the ingredients would have to produce more crops to meet the growing demand, and a resulting impact on the farmland and surrounding environment could be felt. Also, the families of the growing bakeries would feel a societal impact of increased income. Individuals who may have fallen into the lower or middle income range could possibly find themselves at a higher economic and societal status through the use of our product.

Overall, the success of our design could have a measurable influence around Oklahoma. Rural Oklahoma's environment and the society of individuals operating small-sized bakeries are likely to be affected by our finalized device.

Engineering Specifications

1. Definition of Customer Requirements

We needed to create a product that portions dough efficiently in constant amounts formation. The product must be cleanable in the company's sink, so the largest size it can be is 18 by 36 inches. The cost can be negotiated, but it needs to be under $1000, with $200 to $500 being ideal. The dough needs to be dispensed faster than the current production rate to accommodate the opportunity of expanding markets. The dough dispensed also needs to be spaced appropriately to drop the dough on a sheet in four rows of three cookies each.

2. Engineering Specifications

Beyond the customer requirements, the device must meet codes and regulations for food processing. Regulations and codes this device must meet were put forth by the NSF, USDA, ANSI, UL, and CFR. Standards affecting our group's project with Earth Elements are 21 CFR 110 and NSF Standards 2, 8, 51, 73, and 763.

The FDA's Food, Drug, and Cosmetic Act has a section of Current Good Manufacturing Practices that are the standard for designing properly cleanable food processing equipment. To prevent the contamination of the dough, all contact points must be smooth. Bowls and tubes must have not any corners or creases for food to collect in.

The materials used are steel and plastics of food-safe quality to prevent reaction or corrosion in the materials under normal use. The materials also must be nonporous and nonabsorbent, which food-safe plastics are.

Design Concept Evaluation

Each method examined reduces employee exposure to the dough by eliminating as much handling as possible. The alternatives also are versatile in the sense that other mix types, such as meat and spinach balls, can be produced with the device. All of the concepts had the option of either hand or motor operation.

1. Sausage Press

This design concept is based on a sausage press. The theory is to press the cookie dough through an opening like a sausage press presses ground meat through an opening in the side of its container and into tubes for linked sausage. The press operates by the user hand cranking a plate down a cylindrical bowl until dough is funneled through a hole in the bottom. The idea for this design is to modify the press to push cookie dough rather than ground meat. The modification allows the dough to go through the bottom of the container as opposed to the side. Once the dough is pushed through the cavity, a thin wire moves back and forth under the bowl to cut the dough into portions. The entire process for this machine includes:

1. moving the dough from the mixing bowl to the straight-sided bowl,
2. placing the straight-sided bowl under the press,
3. pressing the dough through the opening,
4. separating the dough with a wire once a specific amount is pressed out, and
5. allowing individual cookies to fall onto a baking sheet.

A motor can be added to make this device automatic, which means the operator only has to move the baking sheet. This is a very simple machine to use but requires the dough to be moved from its original mixing bowl into the press's straight-sided bowl. Items to clean include the mixing bowl, straight-sided bowl, stopper, and wire. The machine would be simple to manufacture and contains very few parts. However, a separate bowl aside from the mixing bowl must be used due straight sides being needed for the press. The sides and flat bottom of this bowl prevent it from being used as the mixing bowl. This design was proposed for further review because of its ease in manufacturing and use.

2. Using Mixer

The original concept was to modify the current mixer. The modification would involve creating an attachment that will press the dough down through a mixing bowl with a hole in the bottom. The process of the dough through this machine included:

1. mixing the dough the bowl,
2. removing a plate from the bowl,
3. replacing the mixing paddle with a press,
4. pressing the dough through the hole in the bottom,
5. cutting the dough with a wire, and
6. allowing individual cookies to fall onto a baking sheet.

The bowl in this design must be modified with holes in the bottom along with a plate to hold the ingredients while mixing. The cutting apparatus is similar to that of the sausage press concept. This device would be automatic, and the operator would move the cookie sheet to catch the dough. Additional items for cleaning would include the attachment press, the plate, and the wire. The attachment would be very difficult to manufacture because it would consist of a circular disk moving within another disk. The mixer paddle not only rotates but moves circular around the bowl, so developing a press to fit the current machine would involve too many modifications. This method was not feasible utilized because of the difficulty in manufacturing the attachment.

3. Flip Method

This method consists of having a separate machine to push the dough out of the mixing bowl explained in the previous method. The process of the dough through the machine includes:

1. attaching a plate to the top of the bowl,
2. flipping the bowl over and placing it on a press,
3. securing the bowl on the machine,
4. pushing the dough out with the press,
5. separating the dough with a wire that goes back and forth, and
6. allowing individual cookies to fall onto a baking sheet.

This technique has the possibility to leave a large amount of dough in the bottom of the rounded-bottom bowl. However, three to four cookies could be produced at a time. The items to clean for the method include the bowl, the plate, and the wire. The problems created by this method were the size of the machine and the manual effort of flipping over a bowl filled with dough. Therefore, it also was eliminated as a possibility.

4. Side Pusher

This method uses the mixing bowl and a separate machine. The machine would press the dough out of the bowl, and no bowl modification would be required. The operation would include:

1. placing the bowl sideways on the machine,
2. securing the bowl onto the machine,
3. utilizing a half-moon press to push the dough from the top to the bottom,
4. the dough being fed downward to an opening,
5. separating the dough into equal portions with a wire, and
6. allowing the unbaked cookie to fall onto the baking sheet.

The device would take up a large amount of space and be complex to operate. Also, large dents in the bowl would lead the machine to jam. Items to clean for the method include the bowl, wire, press, and hopper. This method only produces one cookie at a time and would be reasonably difficult to machine.

5. Scooper

This machine would automatically scoop the dough out of the bowl and place it on the cookie sheet. It would be similar to a robotic arm. The operation would include:

1. hooking the machine to the bowl,
2. the machine scooping individual cookies, and
3. the cookie ball being placed on a baking sheet.

The method is hard to machine, requires someone to push the dough towards the scoop, and leaves an excess amount of dough. The items to clean would be about the same as the current process, but the machine would need to be disassembled and re-assembled for every batch. This method was determined not feasible because of the high manufacturing costs and difficulty.

6. Rolling Cutter

Another method is to place the dough on a conveyer and have the cookies cut out. A rolling-cutter design utilizes a "squirrel cage," and its operation would include:

1. placing the dough on a conveyer,
2. allowing the dough to be fed to the roller,
3. the roller cutting out each cookie,
4. the cookies moving to the baking sheet, and
5. Excess dough falling off the conveyer belt.

Large volumes of cookies can be produced with this device, and the cookie sizes and shapes will be consistent. However, the entire machine, including the large conveyor belt, would need to be completely disassembled and cleaned after each use. This design was not considered mainly due to the machine's large size and creation of added clean-up.

7. Continuous Dough Log Cutter

For the continuous dough log cutter, dough is extruded onto a conveyor belt in a continuous stream. The dough then passes under a cutting blade. The device's entire process would include:

1. placing the dough in a hopper,
2. allowing the dough to feed downward,
3. the dough being extruded onto a conveyor,
4. a blade cutting the dough into the individual cookies, and
5. the cookie slices being manually taken off the conveyer and placed on a baking sheet.

This method provides a high volume of cookie output and a mostly automated process. However, the machine would be large, cumbersome, and contain many parts to clean. Cleaning would require the machine's disassembly. Due to these problems, the method was not considered for further evaluation.

8. Hand-held Extruder

One possibility is similar to what is currently available to the "home cooking" market. The idea is to have a hand-held extruder loaded with dough push out individual cookies. The process of the operation would include:

1. placing the dough in the tube,

2. pressing the dough through the opening, and
3. closing the opening by releasing the hand trigger.

The positive aspects of this method are the allocation for accurate placement of individual cookies onto the cookie sheet and the device's small size. However, the device would need to be completely disassembled to be cleaned. This method was not considered further due to the repeated use of the device causing its user to tire. Adding a motor or other power source would eliminate this problem but likely would entail a large amount of machining. Also, the amount of cookie dough the machine could handle would be small, resulting in excess down-time for refilling.

Selection of Design Concept

For our final design, the modified sausage press concept was selected. It needed to be modified in several ways before it could be used by EEMB. We were unable to find a large enough sausage press to hold a minimum of one batch of dough (20 quarts), so it was necessary to build a machine from scratch. To meet the needs of EEMB, the following components were incorporated into the design:

- a 20 quart, stainless steel, straight sided bowl,
- an electric motor to operate the press,
- adjustment controls for different types of dough,
- multiple cookies being extruded simultaneously, and
- adjustments for different sized cookies.

These components are necessary to the design because they will make the press easy to operate, and help EEMB increase productivity. Our small scale sausage press testing proved that the concept works and is faster than hand scooping individual cookies.

Testing design procedure and Implementation

1. Preliminary test part

The amount of force needed to push down depends on the cookie dough being extruded. To determine the maximum force, cookie dough was placed into the bowl, and the plastic piston was placed over the dough. The dough used for this test was an imitation of the client's chunkiest, thickest dough, which was done by adding oatmeal to store bought dough. Weights were placed on the piston until the dough pressed through the holes. A force of 90 pounds was needed to press the dough out of the bowl. The final weight of the bowl was 13.5 pounds and the plastic piston was 23.5 pounds. The support structure needed to withstand the combined load of the bowl, dough, plastic piston, and the pressing force, which came to a total of 87 pounds.

Spacing of holes in the bowl is a critical factor in cookie size. The spacing was determined by the baking spread of the cookies. The volume of dough used in one large and one small cookie was known from the scoops currently used at EEMB. The final volume was determined by measuring the baked cookies sold on campus. On a normal sized, 14 by 20 inch, cookie pan, the appropriate volume of dough for one cookie was formed into a cylinder like the machine would produce. For each test the diameter of the large and small was the same, but the height varied, see table for results.

Dough Spreading Test				
Test 1	Initial Height	Initial Dia	Final Dia.	Current Dia.
Large	1.5"	1.6"	2.7"	2"
Small	1.8"	1.6"	3.3"	3.4"
Test 2				
Large	0.75"	1.9"	3"	2"
Small	1.5"	1.9"	3.25"	3.4"

Table 2: Dough Spreading Test

After baking, the final diameter was measured. The difference in diameter was the spread amount. From this test the holes were spaced 2.5 inches center to center, and the hole diameter was 1.5 inches.

In order to cut the dough, a proper amount of tension was required in the cutting wire. The wire must be tight enough to cut the dough cleanly, but loose enough to avoid breaking. The wire was threaded between two bars with a hand tightened fastener.

Gauge of cutting wire was determined by trial and error. Many gauges were tested. Problems with the wire included clumping with thick wires and breaking with thin wires. The test results were at the discretion of the engineers to determine the toughness of the wire to resist breaking, and how well the dough was cut. The wire diameter of 0.014 inches, or 27 gauge, was determined the most optimum for cutting.

2. Implantation part

Force tests indicated the final force needed to extrude cookie dough through the holes in the bottom of the bowl was approximately 100 lbs. Calculations then were performed to determine the motor power and the gear ratios needed to apply a 100 pound force. For less chunky or thick dough, the pressing force was decreased by reducing the amount of turns needed to press out the same volume of dough. The cutting force can be kept constant independent of the dough type, meaning the force to cut the thickest dough can be used for all types of dough.

Holes in the bottom of the bowl were spaced so that the edges of baked cookies would not touch or just barely touch, and were arranged in a three by four pattern. Hole size can be adjusted by placing a plate with different sized holes in the bottom of the bowl. Also, a speed control knob for the press motor can be used for adjusting how much dough is extruded before the wires cut the dough.

The exact tension needed for the cutting wire was not determined. For proper tension, a 27-guage wire is fed through a small hole on both sides of the machine, and then a locking screw is tightened to hold the wire in place.

After assembly of the machine, it was discovered that the force needed to extrude the dough through the holes was much higher than we expected. As a result, the machine did not function as planned and was unable to extrude the dough. Due to time constraints, changes to the machine could not be made. Instead, we decided on several design changes that would allow the machine to operate properly. First, either a much more powerful motor for the press or a redesign of the press using a food safe hydraulic system is needed. Another change would be to

make the bowl smaller, reducing the amount of surface area that the plunger pressed and, thus, reducing the amount of force needed.

Final Prototype Design

Figure 3: team member, Nikki King, working on the prototype's wiring

Figure 4: prototype side view

Figure 5: plunger used to force dough out of the bottom of the device

Figure 6: holes through which the dough is extruded

Prototype test

The following steps were the sequence for testing the machine to determine how it would function. Since the machine did not function properly, not all the steps were performed. However, we decided the same steps for testing should be followed once the machine is made operational.

1. Place the cookie dough in the cylindrical bowl.
2. Smooth the dough along the bowl's top.
3. Place the bowl into the machine.
4. Power on the machine.
5. Lower the press plate to the top of the dough.
6. Select the proper speed/force for the dough.
7. Slide the cookie sheet under the machine.
8. Press the "cookie dispensing" button on the machine.
9. Hold the baking sheet until the cookie dough is dispensed.
10. Repeat steps seven through nine until all dough is dispensed.
11. Press the reverse button to raise the press plate.
12. Scoop any excess dough out by hand.

1. Cleaning

For cleaning, the press plate and bowl must be removed and hand washed. The rest of the machine can be wiped down after use. The amount of time it would take to clean up all of the items would be approximately fifteen minutes.

2. Testing Results

Our actual prototype was unable to press out the dough given to us by the client due to its thickness. The rate of production would have been slow. The machine ended up being quite

large, as it is 24 inches wide, 22 inches tall and 26 inches deep. The machine is user friendly, with two buttons – a toggle switch and a potentiometer. One button is to make the piston go up or down for thirty seconds. The other button is for dispensing a dozen cookies. The toggle switch determines which direction the piston goes. The potentiometer varies the amount of voltage going to the piston motor to vary the size of the cookie.

3. Discussion and Conclusion

Unfortunately, this prototype did not function as anticipated. In testing, the team used store bought dough with oatmeal added to determine the force that the motors need to exerts. The force required to press the store dough was about 200 pounds as compared to the 5,000 pounds required to press EEMB dough. The pressing motor was not powerful enough to handle the increased requirements. The assumption of the dough's similarity was determined to be wrong. The provided motor was not strong enough to separate the dough. The design and client criterias were not met with this prototype. The client not be able to use it unless modified.

4. Recommendations

Our team recommends using a stronger motor, such as the one shown below, or a hydraulic pump. Also, using a smaller bowl with more holes per surface area is suggested.

Figure 7: Proposed Motor (www.micromo.com)

Schedule and Gantt Chart

Over the course of two semesters, Perfect Mix Creations has progressed through creating a cookie-dough-dispensing device, promotional materials, and business plan for EEMB. A Gantt chart recording the timeline of this process can be seen in Appendix J.

Media/Communications Plan

1. Core Campaign Problem

EEMB needed a more modern, simple, and cohesive design in its collective campaign. The graphic appeal of its previous promotional materials was detracted from by an overwhelming and cluttered presentation of information on each element. In addition, many of the elements were outdated.

2. Previous Campaign Elements

EEMB had a logo, product label, business card, promotional brochure, website, and display signs upon pairing with Perfect Mix Creations in September 2009. Earth Elements was open to all promotional suggestions and revisions aside from altering its two logos – one of which represented its market and bakery and the other representing its farm. The company felt it had built brand recognition around its "green bullets" and spent several years modifying the logos to their present state. Both of the very similar logos were displayed on each campaign element.

In observing the company's previous business card and brochure, they contained numerous differing text fonts, color schemes, and information groupings. The business card was printed on a different paper color and weight than the brochure and contained too much information. The brochure was created in 2006 and contained irrelevant or outdated information. It also contained an overwhelming amount of information presented in a disorganized manner, like the business card. Additionally, the pictures needed to be updated to convey a more professional feel to potential customers. Overall, a decision was made to unify, modernize, and organize the previous business card and brochure.

EEMB's website was lost at one point due to a server complication. After this point, the company utilized the Oklahoma Food Cooperatives website to reach its customer base until Brian Thompson recreated a new company site. The site currently is under construction, but EEMB still wanted us to design an additional site to provide it with two different options. We

were asked to utilize the content of Mr. Thompson's site to create our own that matches our other existing campaign elements in graphic appeal and consumer message.

Final revisions were conducted on Earth Elements' display signs. The company had large signs for its booths at local farmers' markets, however, no smaller signs exist for product displays at convenience stores or other distribution points. As seen in Figure 3, the company's products have plenty of space in most of their display shelves across OSU's campus for a small sign. We intended to create such an element to differentiate EEMB's products from others in the stores and to attract a potential customer's attention as he or she passes by. However, our client expressed greater need for new large booth signs, so it was decided to pursue that avenue instead.

3. New Campaign Elements

We have created a new, cohesive design in all of EEMB's existing campaign elements. Previously, the only thing that tied them together was the company logo. After meeting with our client and discussing the vision she has for her company, we were able to create a modernized and collective campaign design for the business. We initially proceeded by solely using the EEMB logo, which can be seen in Figure 4, as opposed to both since it is on the product label and receives the most public exposure. The logo's label placement can be seen in Figure 5. Brand and product recognition is extremely important to a business's success, so we want Earth Elements' promotional materials to match its products. We believed two separate logos risked confusion.

After selecting one logo, we decided to build off the green color of the company's emblem with additional brown and orange accent colors to represent the organic, wholesome, local feel Earth Elements seeks to portray. This color scheme and design concept has been implemented throughout all elements of the marketing campaign.

In addressing EEMB's business card, the company went against its "one logo" decision and specifically asked for both logos to be portrayed. Our client wanted its customers to recognize the existence of the two separate entities when using the card as a resource. EEMB also wanted to keep its product and ordering information on the card. Since the point of a business card is to relay a company's name, brand, slogan, and contact information as succinctly and uniformly as possible, we met a challenge in keeping the card simple. We overcame this problem by utilizing both sides of the card to spread out the information and avoid overwhelming the observer. The finalized business card can be viewed in Appendix K.

Our client's brochure contains the same background, texts, color scheme, and design concept as the business card. When visiting with the client, specific points in the previous brochure that needed to be included in the new document were identified. These elements included the company's product and service offerings, ordering information, and Ms. Harrington's mission statement. The brochure reveals the "catch-words" handmade, wholesome, and homegrown through its horizontal design with three folds. It was created to be 5.5 inches tall and 17 inches wide, which allows two documents to be printed on one piece of tabloid paper at a time. This arrangement allows EEMB to reduce its promotional costs. Another option for reducing costs was creating a second version of the brochure that does not utilize the graphic background. This version will save on ink costs and eliminate any problems that may arise with bleeds. Printed examples of both brochures can be seen in Appendix L.

The website created for EEMB also utilizes the same background, text fonts, color scheme, and design concept as the previous two elements. As viewers open EEMB's site, the catch-words used in the brochure flash across the EEMB's home page along with a tempting picture of baked goods produced by the company. The navigation bar across the top then allows viewers to move through the "about," "products," "ordering," "kitchen rental," "catering," and "contact" pages. Each page contains the same overall feel as the others with differing content and photos. A screen-shot of the site's home page is illustrated in Appendix M. Should EEMB choose to use our site over that of Mr. Thompson's, the site will be set up under the company's current domain name, www.earthelementsfarm.com.

Our client's display-booth sign is a 2-by-3-foot banner designed for both indoor and outdoor events. It is designed to attract the attention of individuals passing by EEMB's booth at farmers' markets and other events our client attends. The sign also contains the same design elements as the other promotional materials to finish off our client's collective campaign. A small-scale version of the banner can be seen in Appendix N.

Digital copies of each campaign element, including print-quality PDFs and all necessary website files, have been included on a CD for EEMB. This was done to provide EEMB flexibility in choosing the most suitable printer and website host for its needs.

4. Campaign Element Costs

Price is an important consideration for EEMB's campaign elements. Our client is a small business with limited resources for promotional materials and stressed to us the importance of

fiscal conservatism in promotional materials. All materials have been produced in-house up to this point due to the owner, April Harrington, having a graphic design background. In-house production has allowed the company's marketing costs to remain minimal. All printing has been done by Wolf Laser, a company out of Noble, Oklahoma, with whom EEMB has a standing relationship. Earth Elements' costs for its current promotional materials versus its costs for the new materials have been outlined in Table 3. Different options have been provided for EEMB to consider in choosing the most suitable printer for the new promotional materials. While the new documents are slightly more expensive than what our client has used previously, we anticipate the increased business generated by the updated, attractive materials. However, should EEMB decide the projected prices are too high, the business card and banner have a version on the CD without the graphic background, just like the brochure. Removing this background will eliminate the need to utilize a litho printer that can handle document bleeds. EEMB then would be able to take the business card and brochure to Wolf Laser for comparable prices to what has been paid previously.

Figure 8: Product Display

Figure 9: EEMB Logo

Figure 10: EEMB Product Label

	Printing Company	Product	Specifications	Cost
Current	Wolf Laser Noble, OK	business card	one sided, full color	$28.99 for 250 cards
		brochure	legal size, two color	$28.50 for 50 sheets
	King Copy Norman, OK	display sign	2’ x 3’ laminated sign	$20
New Options	Hooper Printing Norman, OK	business card	two sided, full color, bleed	$30 for 250 cards
		brochure	tabloid size, full color, bleed	$40 - $50 for 50 sheets
			tabloid size, full color, no bleed	$32 - $42 for 50 sheets
	Cowan Printing Bethany, OK	business card	two sided, full color, bleed	$45 for 250 cards
		brochure	Tabloid size, full color, bleed	$72 for 50 sheets
	OSU Sign Shop	display sign	2’ x 3’ print banner, hemmed, with grommets	$50
	Action Sign & Design	display sign	2’ x 3’ print banner, hemmed, with grommets	$72

Table 3: EEMB Campaign Elements Costs Comparison

Business Plan/ Financial Analysis

1. Financial Statement

One of Perfect Mix Creations' largest goals for this project has been to make a financially stable decision for our client. The investment in a cookie dough extruder was intended improve the situation of the company for many years had the prototype been a success.

2. Calculating Profits

Since our design proposal mostly affects cookie amounts sold, the focus has been on calculating the profits of cookies sold. Earth Elements currently sells its small cookies at $1.39 per six-pack to Oklahoma State University. Although the amount sold per week currently is inconsistent, room for growth is apparent in this market. Other small cookie sales take place through the Oklahoma Food Cooperative for $4 per dozen. Currently, Earth Elements can produce a maximum of 900 to 1,200 cookies per day. These high numbers only are obtained on an extremely productive day when an employee focuses solely on cookie production. Such production does not occur daily due to the amount of strain it causes on an employee's wrists and the need to bake or create other products. Therefore, Earth Elements would have considered our device a success if it could produce more than 900 cookies per day. Such a production increase coupled with a growing market would have made our device economically beneficial to Earth Elements.

Another aspect of calculating profit is cutting costs. Two major areas of costs that will be decreased are labor costs and distribution costs. Earth Elements' distributors charge from 2 to 5 percent of the company's sales for product delivery. The percentage varies depending on shipment size – the larger the shipment, the lower the percent charged. If the company consistently sends larger shipments around the state, it will be charged consistently less for delivery. The decrease in labor costs can be calculated by how many "man hours" it takes to mix and create a given amount of cookies. The labor costs saved can be seen in the spreadsheet included in Appendix O. As stated earlier, one employee can produce a maximum of 900 to 1,200 cookies a day. An increase in production would have caused the amount of cookies per man hour to rise and, therefore, decrease the labor dollars spent per cookie.

3. Cost versus Benefit

The new system's benefits were measured by the rate at which cookies are scooped. In a test done by our engineers, hand scooping was conducted at a rate of 12 cookies per minute. A sausage press, which is what was modified to make our prototype, produced approximately 16 cookies per minute. The benefit of increased production must be weighed against the cost of the cookie dough extrusion system. The prototype's total cost was estimated to be $645. After purchasing supplies for building and testing, the current budget for the prototype is $2,492.03.

Labor hours play a major factor when evaluating this cost versus the benefit of increased production. Earth Elements' employees make between $8 and $9 per hour. At these rates, our prototype would have had to save approximately 93 hours of labor to be justified. This means the money saved on less labor costs was used to pay for the investment of the cookie dough extruder. The spreadsheet in the appendix outlines the investment and how it could have been justified financially. Examples of production by a bakery worker before the new extrusion system were used to show a comparison to what the production rates will be like now.

Our machine was estimated to produce up to 1,920 cookies in an eight hour day since it was projected to make four cookies per minute more than the previous process. Depending on the amount of cookies needed each day, our device would have enabled more time to be spent in other areas of the bakery. For example, if a limit of one-thousand cookies per day were set, the new process would have made those cookies approximately 2.5 hours faster throughout the work day. The resulting extra time around the bakery would allow employees to be more diligent with other tasks. Additional factors such as employee satisfaction and productivity also might have been improved by producing cookies at a faster rate.

A digital copy of the complete production spreadsheet illustrated in Appendix O is available for EEMB. The spreadsheet includes input values, market projections, personnel expenses, expense projections, operations summary, and dough costs. This file can be updated by EEMB using the current costs and profit that it is experiencing. Customizations also can be made if EEMB wants to take out a loan or make an investment in the company.

One of the tabs in the Excel file includes the expenses for labor. These costs can be entered using the hourly wages paid to employees. The number of weeks or days a person works in a year also can be manipulated. The spreadsheet automatically will calculate the expenses for a year and report them as a whole in the total expenses page.

The dough-costs section goes through a batch of cookie dough and breaks down its ingredients costs. Costs can be added, taken out, or changed. This section also breaks down the costs between the four different types of cookies in production. The types include one-dozen small cookies, one-dozen small shortbread cookies, small six-packs, and large singles. It has been assumed all of the cookie "flavors" have the same input costs for the dozen packs except the shortbread, which is why it has its own section. After the costs of the ingredients are calculated, this section continues by adding packaging costs. All costs then are totaled on a per unit basis so it can be added into the total production costs for any given amount of production.

The expense-projection tab is broken down in to variable costs, fixed costs, and other costs. This section includes personnel expenses and dough costs with rows available for other expenses to be added. For the sake of this project, only the cost of making the cookies is considered. The projections of these costs can go out for ten years from the current date.

These total costs now can be taken to calculate the input values for the four different types of cookies and make market projections. EEMB can utilize this program to determine an estimation of its sales volume for the next year. After this is entered, the spreadsheet will use the calculations of the current year to make projections for the next ten years. The market-projection tab includes sales volume, sales price, gross sales, and total gross sales for the four types of cookies. After this calculation, the spreadsheet shows total variable costs for the cookies and subtracts it from the total gross sales.

The complete spreadsheet has been individualized to meet the needs of EEMB but has the freedom to be changed pending other circumstances. The goal of this spreadsheet is to show EEMB what its profit margin can be given the amount of cookies it produces, the length of time it takes to make them, the input costs, and the cookies' prices. These calculations are intended to help EEMB make educated financial decisions over the next several years.

Proposed and Actual Budget

1. Costs Overview

The budget for the prototype includes input costs incurred through constructing and testing the device. Costs will be paid for by the budget given to our group through the Innovations class in addition to money allotted by Dr. Rodney Holcomb. All costs will be recorded to keep track of the money spent on the prototype. Earth Elements ideally sought to spend between $200 and $500 for our finalized product. However, we realize the synthesis and testing of a prototype will cost much more.

2. Cost of Materials

Our group initially visited Lowe's to examine different materials and prices. After speaking with Dr. Paul Weckler during the visit, it was decided to search for some materials through McMaster-Carr's Web site. The company has more than 480,000 products, including hand tools and raw materials. The site gives the prices with the quantity per package and also allows partial packages to be purchased.

In addition to purchased materials, our group also had access to supplies in OSU's BAE construction lab. The lab has bins of scrap metal that can be used for fabrication. Such materials will not add to expenses as long as the scraps already have been disposed of in the bins.

3. Testing Costs

The price for testing the prototype was minimized in several aspects. A sausage press was purchased to use for testing purposes, to be modified as a part of the prototype, or possibly to fulfill both purposes. Another major testing input was the dough produced by Earth Elements. Our client provided us with this input free of charge. We also had access to several locations, including the BAE lab, the DML, and the Food and Agricultural Products Center (FAPC), to conduct testing. The sites were provided at no cost and had several tools available for various testing procedures.

4. Proposed Budget

All prices were compiled last semester to propose a budget in December. Items taken into consideration for prototyping included:

- "scoopers" comparable in size to Earth Elements' for output comparison,

- a sausage press for examination and modification,
- wire for cutting the dough,
- motors, gears, and wire for automation, and
- Plexiglas and stainless steel for testing other alternatives.

While it was necessary for all purchases to take place and be recorded for a final calculation, we estimated a total prototype cost of $855. The price break-down can be seen in Table 4.

Item	Quantity	Cost/Item	Fall 09	Spring 10
Sausage Press	1	$200	$200	
Scooper	2	$15	$30	
Motor	2	$15		$30
Wire	1	$40		$40
Polyethylene	1	$200		$200
Connection Hardware				$60
Bowl	1	$100		$100
Gears				$100
Electrical Hardware				$30
Stainless Steel	2	$5		$10
Miscellaneous				$35
Dough				$20
		Costs	$230	$625
		Total Cost		$855

Table 4: Proposed Budget

5. Actual Budget

Upon the completion of the project, all costs were calculated and compiled into Table 5. The total cost of producing the prototype was $2,492.03.

Date	Number	Split	Name		Amount
10/28/2009	P4672581	Lab Supplies	Creamy Treats Makers		$18.95
10/28/2009	P4672580	Lab Supplies	Kitchen and Restaurant		$33.41
10/28/2009	P4694210	Lab Supplies	Northern Tool and Equip.		$87.67
1/26/2010	P6951035	Lab Supplies	Walmart		$10.44
1/26/2010	P6985219	Lab Supplies	Food Pyramid		$11.97
2/1/2010	P7134260	Lab Supplies	Food Pyramid		$10.78
2/23/2010	P7622791	Lab Supplies	Ideal True Value		$17.38
2/23/2010	P7723516	Lab Supplies	All Electronics		$29.55
2/23/2010	P7652038	Lab Supplies	McMaster Carr		$273.39
2/23/2010	P7652039	Lab Supplies	KaTom Restaurant Supply		$110.14
3/1/2010	P7797174	Lab Supplies	KaTom Restaurant Supply		$185.01
3/4/2010	P7901521	Lab Supplies	McMaster Carr		$44.21
3/23/2010	P7652037	Lab Supplies	McMaster Carr		$84.55
3/11/2010	P8067639	Lab Supplies	McMaster Carr		$114.78
3/12/2010	P8067640	Lab Supplies	McMaster Carr		$66.50
3/31/2010	P8512607	Lab Supplies	Stillwater Steel		$74.50
4/6/2010	P8598213	Lab Supplies	Grainger		$312.88
4/7/2010	P8654545	Lab Supplies	Astrodyne		$307.36
3/29/2010	P8389007	Lab Supplies	McMaster Carr		$445.23
4/16/2010	P8869293	Lab Supplies	Stillwater Steel		$7.00
3/29/2010	P8653432	Lab Supplies	McMaster Carr		$31.60
3/29/2010	P8453433	Lab Supplies	McMaster Carr		$121.13
4/19/2010	P8627002	Lab Supplies	Critical Velocity		$93.60
Total					**$2,492.03**

Table 5: Actual Budget

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Perfect Mix Creations

Dough Dispensing Device for Earth Elements Market and Bakery

April 2010

Client

Earth Elements Market & Bakery

- owner: April Harrington
- location: Lexington, OK
- products
  - locally grown
  - seasonal ingredients
  - over 200 on average
  - 17 are cookies

Problem Statement

Earth Elements Farm needs a **quick** and **efficient** way to create uniform COOKIES through a device dispenses dough in a **consistent** manner.

The company also needs **new** or revised **promotional** materials to market its products.

Mission Statement

At Perfect Mix Creations, we **fix** our clients' "mixed-up" **business headaches**. Through **emphasis** in communications and product development, we create **innovative** solutions to make **your company** more **profitable**.

Our dedication to **excellence** and professionalism makes us the perfect **solution** for your next company conundrum.

Fall Semester

- Analyze and define the problem
- Develop a WBS and task list
- Proposed media and communication plan
- Business analysis
- Generate design concept
- Design prototype
- Develop a schedule
- Develop a budget

Spring Semester

- Prototype
  - Materials acquisition
  - Building prototype
  - Testing prototype
- Communications
  - campaign elements
- Business
  - Return-on-investment spreadsheet

Perfect Mix reations

www.earthelementsfarm.com

Earth Elements

EEMB

GROWN

Market & Bakery, LLC

Pick-up window

405-872-3722

Prototype

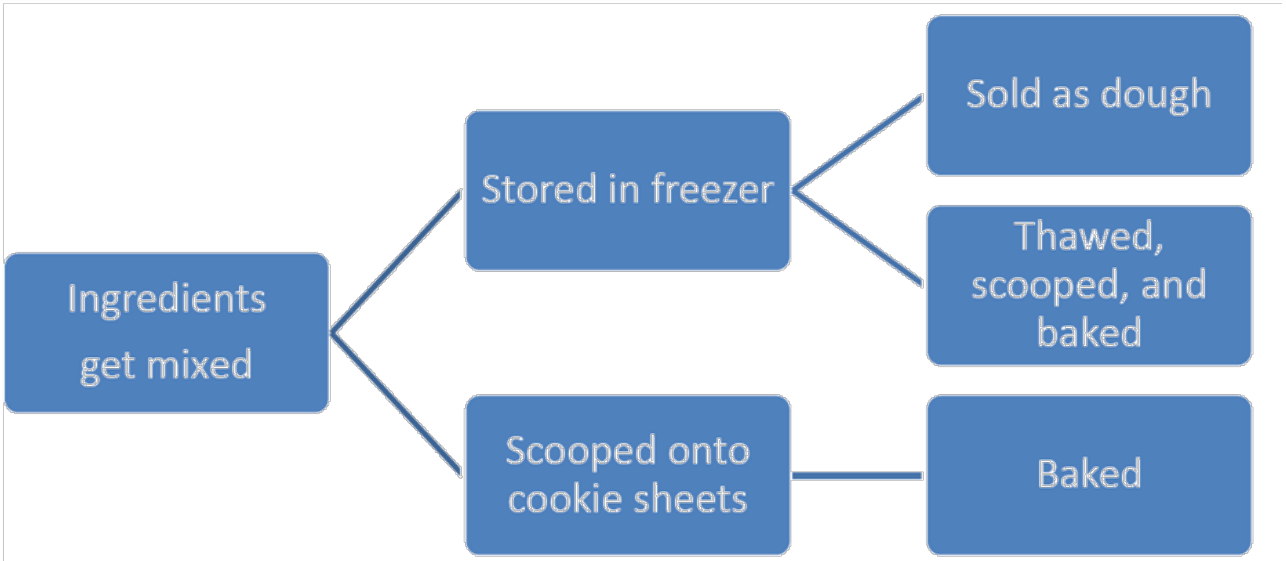
Client's Criteria

- Deadline: April 29, 2010
- Design production: 900 cookies/day
- Consistency in size and shape of cookie
- Simple operation
- Maximum size: Fit into sink 18" x 36"
- Minimal amount of parts
- Easy to assemble and disassemble

Design Factors

- Hazard Analysis and Critical Control Points (HACCP) Plan
  - description of food
  - flow chart of cookie production
  - critical Control Points established
- Food and Drug Administration (FDA)
  - non-absorbent materials
  - smooth, rounded surfaces
  - avoid entry of contaminates
- Patents: Extruders
  - Cookie press
  - Sausage press
  - In 1913, public knowledge

Current Process



Problems

1. time consuming
2. labor intensive
3. portion control
4. waste

Proposed Process

Sausage Press

- Process
- Pros
  - either electronic or manually operated
  - simple to use
  - simple to machine
  - few parts for assembly and disassembly
- Cons
  - moving dough to new bowl

Power Screw Equation

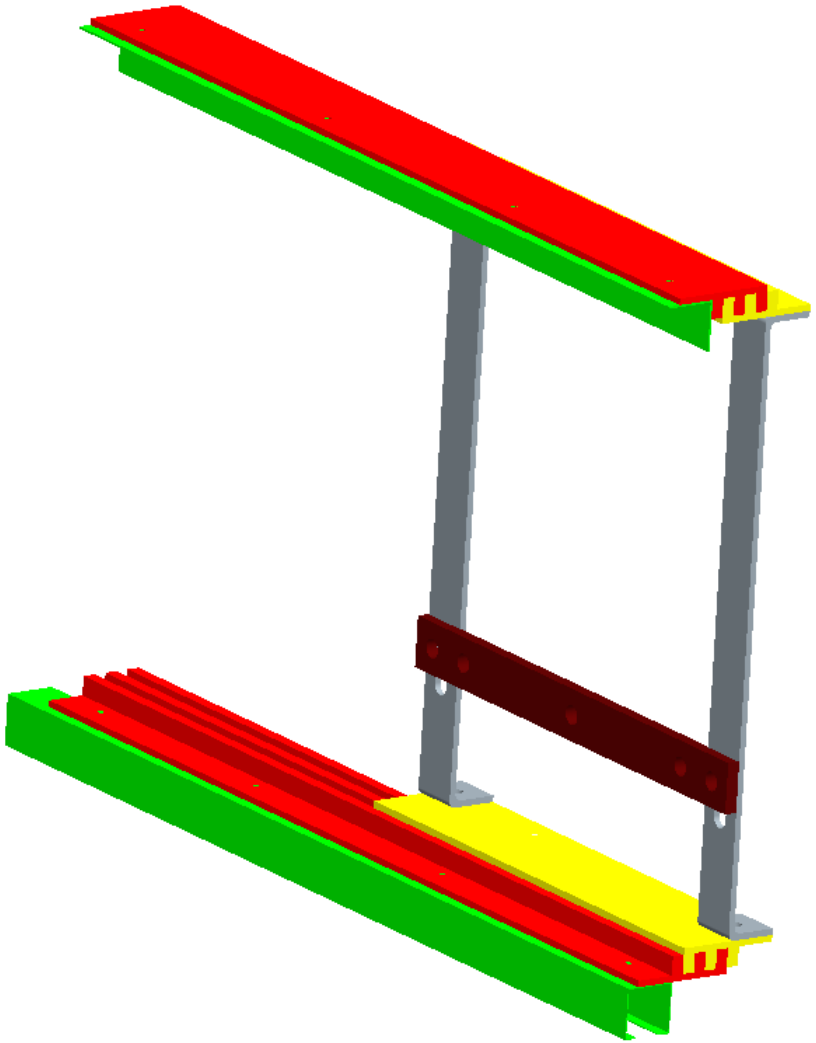
$$T_R = \frac{F d_m}{2}\left[\frac{1 + \pi f d_m \sec\alpha}{\pi d_m - f l \sec\alpha}\right]$$

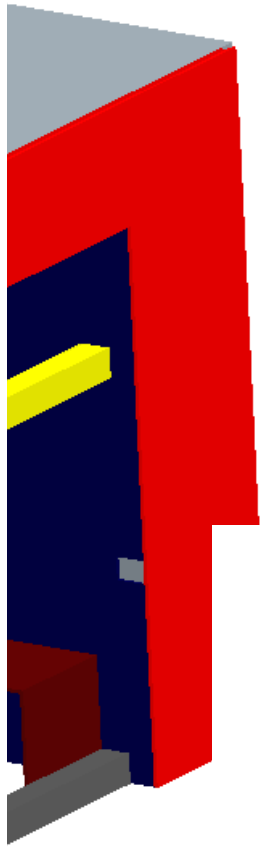
$$F = 200\ lb \qquad f = 0.7 \qquad d_m = 1.0\ in$$

$$\alpha = 14.5° \qquad l = 0.2\ in$$

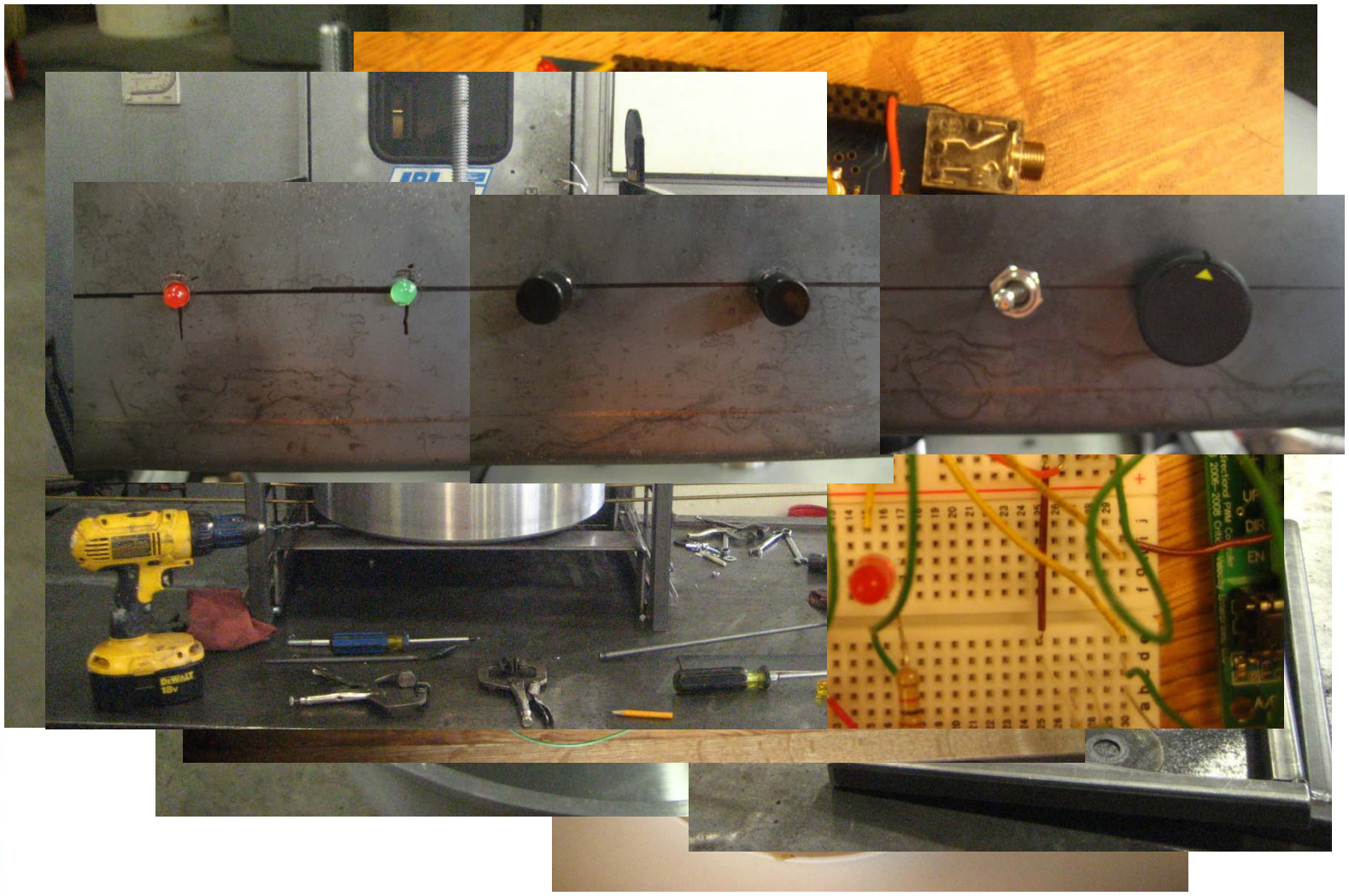
$$T_R = 109.2\ in \cdot lb$$

CAD Drawings





Prototype



Final Analysis

Last Test

- Force for EEMB dough requires 5,000 lbs
- Store bought dough requires 200 lbs

Recommendations

- Hydraulic press
- Smaller bowl
- Auger system

Perfect Mix reations

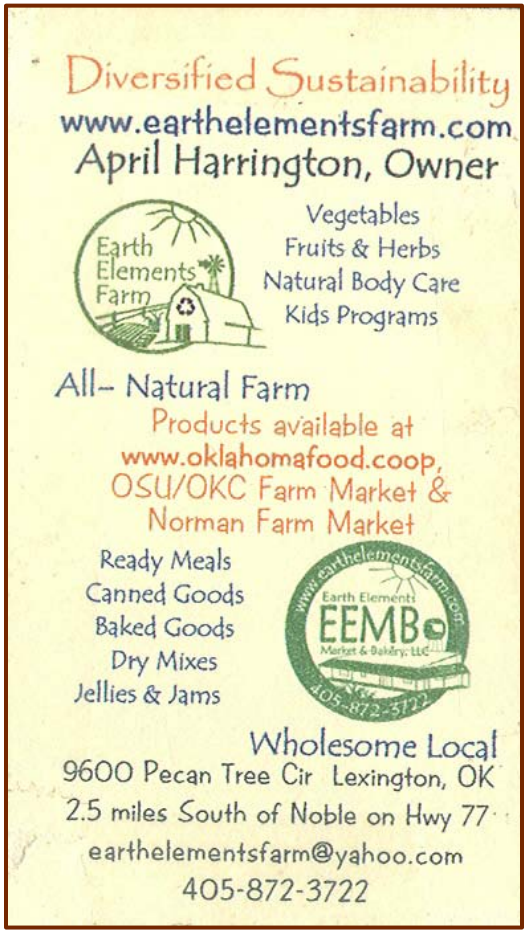
Campaign Materials

EEMB Campaign Materials

- Previous elements
  - business card
  - brochure
  - website
  - display sign
- Previous problems
  - cohesiveness
  - outdated

EEMB Campaign Materials

- Previous business card



EEMB Campaign Materials

- Previous brochure

Earth Elements Mission is to provide our community with healthier, local food alternatives. By buying direct from local farmers and producers, EEMB can preserve, process, and prepare local ingredients in a wholesome manner, encouraging our community to enjoy Oklahoma grown and Made in Oklahoma products. Earth Elements strives to provide a way for Oklahoma farmers to feed Oklahomans.

Earth Elements journey towards a sustainable food system was inspired by facing the challenges of battling ovarian cancer. These challenges opened my mind to new ideas and gave me the strength to travel the uncharted paths towards a sustainable life.

The last ten-plus years have been an exciting experience from producing fresh herbs and herbal products, to growing organic fruit and vegetables, to educating an array of curious minds of all ages.

Following the path taught to me, first by my grandmother and a few other influential women in my life, the art and skills of preserving food and sharing the harvest has led me here today to accomplish the mission of helping Oklahoma farmers feed their communities.

Earth Elements was established in 1996 from open-minded ideas and has grown with the help of many helping hands and creative minds. Their energy and spirit will always be appreciated and remembered.

Thank you to all who support our cause and who have shared this journey of preserving food, communities, and our heritage.

-April Harrington, Founder of Earth Elements Farm and the "EEMB" Earth Elements Market & Bakery

EEMB PRODUCTS AVAILABLE AT THE FOLLOWING:

- OSU/OKC, NORMAN, EDMOND FARM MARKETS
- NATIVE ROOTS MARKET
- CRESCENT MARKET
- HEALTH FOOD CENTER
- GOURMENT GALLERY
- LA BAGUETTE

EEMB's "GREEN" production facility

DIVERSIFIED SUSTAINABILITY
www.earthelementsfarm.com

Earth Elements EEMB Market & Bakery, LLC 405-872-3722

Made in OKLAHOMA

Wholesome Local Food Bakery & Production Kitchen

Established 1998

Ok-Grown

All-Natural Farm

www.earthelementsfarm.com Earth Elements Farm 405-872-3722 Lexington, Ok Wholesome Handmade Fresh

Order Online @
UAOklahoma.com
for Weekly OKC Metro delivery and the EEMB drive thru
OR
OklahomaFood.coop
for Monthly Statewide Pick-up

9600 Pecan Tree Circle, Lexington, OK
earthelementsfarm@yahoo.com
405-872-3722

ARE YOU A LOCAVORE?

Value-Added Products made with Local and Organic Ingredients!

BAKED GOODS
Made with Oklahoma Wheat
Whole Wheat Baguettes
Whole Wheat Pizza Crust
Whole Wheat Pretzels
Quick Breads & Muffins
Brownies & Cookies
Granola & Crackers
Sugar- Free Muffins & Cookies

READY MEALS
Local Ingredient
Soups & Sauces
Casseroles & Lasagnas
Pizzas & Calzones
Lunch Items

CANNED GOODS
Homemade Canned Soups
Jams, Jellies
Sugar- Free Jams, Jellies
Sweetened with Stevia
Pickled and Preserved Fruits and Vegetables

EDUCATION
Kids Programs
Girl Scout Badge Programs
Adult Sustainability Skill Workshops
Straw bale Building Workshops

The new EEMB Production Kitchen

GARDEN CROPS
Heirloom Varieties
All crops are grown by the same standards - as certified Organic
Certified Organic 1999-2004
not anymore

DIVERSIFIED SUSTAINABILITY

GREEN BUILDING
Home of the Straw bale Bakery
Rain water Catchment Experiments
The new EEMB solar passive production Bakery built from AAC (Aerated Autoclave Concrete)

Strawbale Bakery

HELPING OKLAHOMANS PRESERVE THE HARVEST

EEMB offers 3 unique opportunities for growers and producers of local food

- WHOLESALE INGREDIENTS
  EEMB purchases surplus and number two ingredients from local producers
- PRIVATE LABEL / CO PACKING
  EEMB will Co-pack /private label for growers and producers
- KITCHEN RENTAL
  The EEMB facility is available for rental to producers to value-add their products

Sell your products through the Okla Food Coop

Casual Locavore CATERING
Local Food for Local Events
Specializing in out door and informal meals made from seasonal Oklahoma ingredients

LOCAVORE IS SOMEONE WHOSE DIET CONSISTS OF FOOD GROWN OR PRODUCED WITHIN A REASONABLE (200 MILE) DISTANCE FROM THEIR HOME

EEMB Campaign Materials

- Previous websites

EEMB Campaign Materials

- Previous websites

EEMB Campaign Materials

- Previous display sign

EEMB Campaign Materials

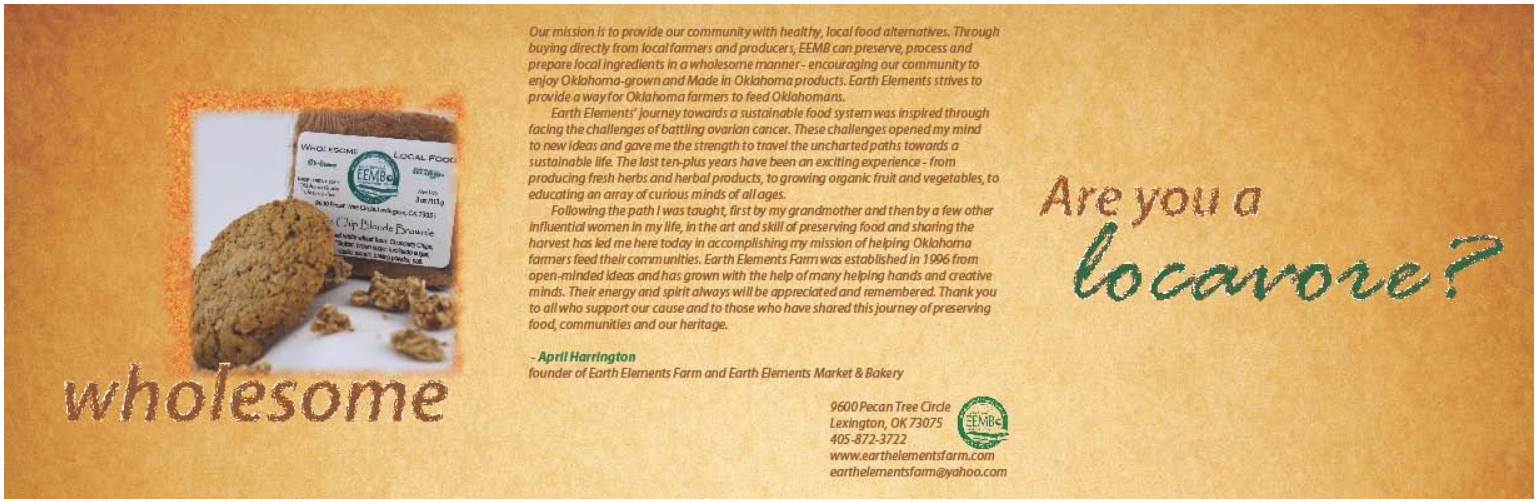
- New elements
  - business card
  - brochure
  - website
  - display sign
- New design
  - color scheme
  - slogans

EEMB Campaign Materials

- New business card

EEMB Campaign Materials

- New brochure



EEMB Campaign Materials

- New website

EEMB Campaign Materials

- New display banner

EEMB Campaign Materials

- Printing prices

Current			
Printing Company	**Product**	**Specifications**	**Cost**
Wolf Laser Noble, OK	business card	one sided, full color	$28.99 for 250 cards
	brochure	legal size, two color	$28.50 for 50 sheets
King Copy Norman, OK	display sign	2’ x 3’ laminated sign	$20

EEMB Campaign Materials

- Printing prices

New Options			
Printing Company	**Product**	**Specifications**	**Cost**
Hooper Printing Norman, OK	business card	two sided, full color, bleed	$30 for 250 cards
	brochure	tabloid size, full color, bleed	$40 - $50 for 50 sheets
		tabloid size, full color, no bleed	$32 - $42 for 50 sheets
Cowan Printing Bethany, OK	business card	two sided, full color, bleed	$45 for 250 cards
	brochure	Tabloid size, full color, bleed	$72 for 50 sheets
OSU Sign Shop	display sign	2’ x 3’ print banner, hemmed, with grommets	$50
Action Sign & Design	display sign	2’ x 3’ print banner, hemmed, with grommets	$72

Perfect Mix reations

Business Analysis

Competitive Analysis

Industrial Analysis

- Decrease in industry growth
- Earth Element
  - 75% growth over the past five years

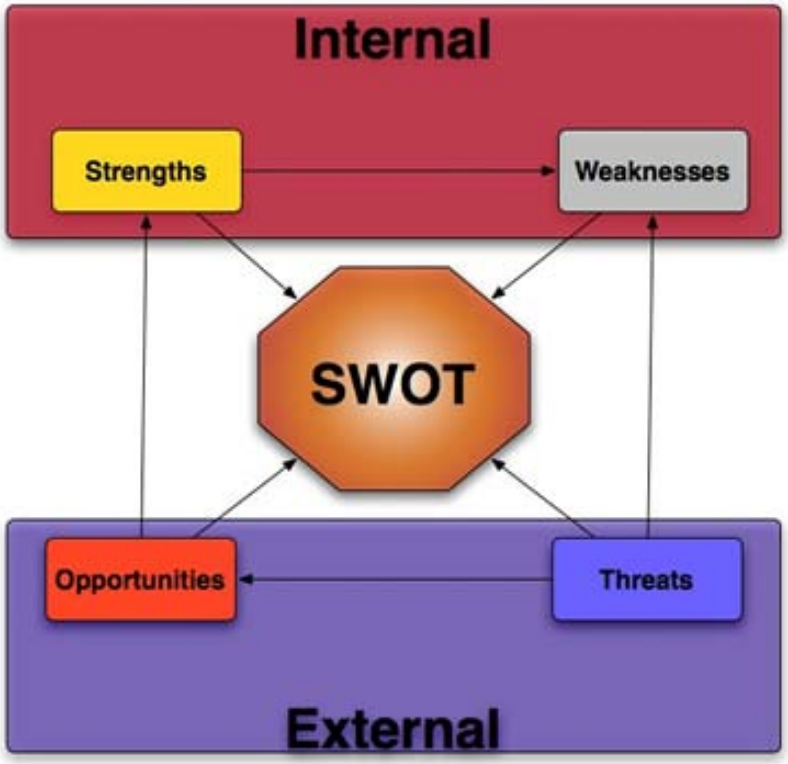
http://www.okgrown.com/

Competitive Analysis

Competitors and resources

SWOT Analysis

- Strength
  - simple process
- Weakness
  - large labor force
- Opportunity
  - higher productior
- Threat
  - waste



http://hrmadvice.com/assets/images/swotanalysis.jpg

Benefits of Investment

Production Spreadsheet

- Cost
  - labor
  - Input

- Amount produced
  - market projections

Benefits of Investment

FORWARD TO OPERATIONS SUMMARY

Sales Projections

		Year 1	Year 2	Year 3	Year 4	Year 5
Dozen - small	box	500	500	500	500	500
6-pack	bag	500	500	500	500	500
Singles	indiv. u	500	500	500	500	500
Shortbread	box	500	500	500	500	500
		2,000	2,000	2,000	2,000	2,000

Gross Sales Projection

This sheet summaries the volume and price and sales growth information from the input page. There

	Year 1	Year 2	Year 3	Year 4	Year 5
Dozen - small					
Total Volume	500	500	500	500	500
Price/Unit	$ 2.80	$ 2.80	$ 2.80	$ 2.80	$ 2.80
Gross Sales	$ 1,400	$ 1,400	$ 1,400	$ 1,400	$ 1,400
6-pack					
Total Volume	500	500	500	500	500
Price/Unit	$1.390	$1.390	$1.390	$1.390	$1.390
Gross Sales	$695	$695	$695	$695	$695
Singles					
Total Volume	500	500	500	500	500
Price/Unit	$ 0.88	$ 0.88	$ 0.88	$ 0.88	$ 0.88
Gross Sales	$ 440.00	$ 440.00	$ 440.00	$ 440.00	$ 440.00
Shortbread					
Total Volume	500	500	500	500	500
Price/Unit	$ 3.15	$ 3.15	$ 3.15	$ 3.15	$ 3.15
Gross Sales	$ 1,575.00	$ 1,575.00	$ 1,575.00	$ 1,575.00	$ 1,575.00
TOTAL GROSS SALES	$4,110	$4,110	$4,110	$4,110	$4,110
Production Expense					
Dozen - small	$ 718	$ 718	$ 718	$ 718	$ 718
6-pack	$ 421	$ 421	$ 421	$ 421	$ 421
Singles	$ 273	$ 273	$ 273	$ 273	$ 273
Shortbread	$ 935	$ 935	$ 935	$ 935	$ 935
TOTAL VARIABLE EXP.	$ 2,347	$ 2,347	$ 2,347	$ 2,347	$ 2,347

Conclusion

Thank you for your time ☺

Questions?

Comments?

Design Proposal Report

Dough Dispensing Device for Earth Elements Market and Bakery

Leah Kuehn, Nikki King, Sarah Cary,
Jay Bessinger, Richie Alexander

Table of Contents

Mission Statement

At Perfect Mix Creations, we seek to fix our clients' "mixed-up" business headaches. We create innovative solutions through emphasis in product development and communications to make your company more profitable. Our dedication to excellence and professionalism makes us the perfect solution for your next company conundrum.

Problem Statement

Earth Elements Market and Bakery needs a quick and efficient way to create uniform cookies through a device that consistently dispenses the same amount of dough. The company also needs new or revised promotional materials to market its products.

Statement of Work

Submitted by:
Perfect Mix Creations

Cookie Dough Dispenser for Earth Elements Market and Bakery

1. Objectives

1.1 Create a quick and efficient way for the client to produce uniform cookies through a device that consistently dispenses the same amount of dough.

1.2 Create new or revised promotional materials to market the client's products.

2. Background

2.1 Earth Elements' goal is to build a local food system through preserving locally grown ingredients and keeping them in the community. It utilizes crops grown on its own farm and those from other local farmers to produce "authentic" Oklahoma foods. A major component in the business is creating baked goods from hand-scooped doughs or mixes. Goods created in this manner include cookies, spinach balls, and meat balls. Cookies comprise the largest percentage of these goods, as employees hand scoop a maximum of 900 to 1,200 cookies per day. The client is limited to its current production by time. It needs a more efficient way to dispense the doughs and mixes to increase production. The client has tried several other "cookie dispensers" with limited success.

2.2 Earth Elements currently is at a standstill in annual growth after experiencing a 20 percent increase per month over the past two years. The present economy along with the client's limited production and lack of marketing promotions contribute to the client's present financial state. Perfect Mix Creations seeks to remedy Earth Elements' problems through increasing production and customer awareness.

3. Scope of Work

3.1 Perfect Mix Creations shall submit a design proposal report to presiding professors that includes:

- 3.1.1 a problem statement, statement of work, work breakdown structure, and task list.
- 3.1.2 a competitive analysis report including market and patent research
- 3.1.3 a definition of customer requirements and development of engineering specifications.
- 3.1.4 a proposed media and communications plan.
- 3.1.5 a generation of design concepts including the feasibility and determination of suitable designs.
- 3.1.6 a Gannt chart project schedule.
- 3.1.7 a proposed budget for the prototype

3.2 Perfect Mix Creations shall provide a design proposal oral presentation including all materials presented in the design proposal report to presiding professors and the client.

3.3 Perfect Mix Creations shall submit self- and peer-evaluations to presiding professors.

3.4 Perfect Mix Creations shall submit a team Web site to presiding professors.

3.5 Perfect Mix Creations shall submit individual project notebooks to presiding professors.

3.6 Perfect Mix Creations shall conduct a one-on-one interview between the project's team leader and presiding professors.

3.7 Perfect Mix Creations shall submit a working prototype followed by a final design to presiding professors and the client. Steps taken to deliver the final product will include:

- 3.7.1 checking all relevant patents to make sure there are no infringements.
- 3.7.2 inspecting all standards so the machine is built to code .
- 3.7.3 creating computer-aided design (CAD) drawings to show the client the best options.
- 3.7.4 building prototypes to test possible alternatives.
- 3.7.5 testing the machine to verify allotment of the correct dough amount in a proper manner.
- 3.7.6 finding the most economical means to build the machine to meet the client's funding requirements.

3.8 Perfect Mix Creations shall submit campaign element drafts followed by the final products to presiding professors and the client. The campaign elements include:

- 3.8.1 a business card.
- 3.8.2 a brochure.
- 3.8.3 a both display sign.
- 3.8.4 a Web site.

4. Location of Work

4.1 Design development:

4.1.1 Multiple locations will be required for the development of the dough-dispensing device. Work involved in the device's production includes computer drawing, fabricating, testing, and analysis.

4.1.2 CAD drawings will be completed in the Oklahoma State University engineering computer labs. All engineering labs have computers installed with CAD software. The labs are located in the Engineering South, Engineering North, Cordell, and Kerr-Drummond buildings. Cordell and Kerr-Drummond are open 24 hours per day, and Engineering South and Engineering North are open from 7 a.m. to 11 p.m.

4.1.3 Fabrication will be conducted either in the Design and Manufacturing Lab (DML) or the Biosystems and Agricultural Engineering (BAE) construction lab depending on needed tools and the lab availability. The fabrication includes prototype and final product creation. The DML is located off campus, and the BEA construction lab is on campus.

4.1.4 Testing will take place in OSU's Food and Agricultural Products Center (FAPC). Dough will be mixed and dough-dispensing trials will be conducted in the lab's bakery section. Data on the device's performance will be gathered for analysis. Small adjustments to the hardware may be conducted at FAPC, but major alterations require the DML or BAE lab.

4.1.5 Analysis of the device will require Microsoft Excel. Any computer lab on OSU's campus can be utilized for the analysis. The library also may be used to collaborate and understand the data.

4.2 Campaign elements development:

4.2.1 Campaign elements will be designed on computers containing the necessary software, such as InDesign, Photoshop, Dreamweaver, and Illustrator. The location of work may include any OSU computer lab or the home of the communications specialist depending on the programs' availabilities.

4.2.2 The location of campaign element production and printing will be decided jointly by Perfect Mix Creations and the client.

5. Period of Performance

5.1 Project initiation date: August 17, 2009

5.2 Project completion date: May 7, 2010

5.3 Hours dedicated to project:

5.3.1 design development and production: 6 hours per week
5.3.2 marketing / promotional materials: 6 hours per week

6. Delivery Requirements

6.1 Deliverables schedule:

Item	Delivery Date
competitive analysis report	Oct. 26, 2009
statement of work	Oct. 30, 2009
work breakdown structure	Nov. 6, 2009
task list	Nov. 16, 2009
design proposal report draft	Nov. 23, 2009
design proposal report	Dec. 4, 2009
design proposal oral presentation	Dec. 4, 2009
self- and peer-evaluations	Dec. 7 - Dec. 11, 2009
team Web site	Dec. 7 - Dec. 11, 2009
project notebooks	Dec. 7 - Dec. 11, 2009
project leader interview	Dec. 7 - Dec. 11, 2009
campaign elements drafts	Apr. 5, 2010
working prototype	Apr. 5, 2010
finalized campaign elements	May 7, 2010
final product	May 7, 2010

6.2 Perfect Mix Creations shall provide weekly updates to presiding professors on the progress of design, business, and communications elements.

7. Applicable Standards

7.1 Hazard Analysis and Critical Control Points (HACCP) Plan

7.1.1 To ensure our machine complies with industry safety standards, a HACCP plan will be developed and followed. A description of the type of food being processed, the food's intended use, and how the food's distribution methods will be the first step. A flow chart will be constructed showing the steps involved in the entire cookie production process. Potential hazards with the machine will be identified and evaluated on the basis of the hazard's severity and probability. Corrections will be made to design aspects deemed overly hazardous. Critical control points (CCPs) will be implemented by Earth Elements during the mixing of the dough and transferring the dough to the machine. Monitoring the quality of the dough and taking corrective actions to fix problems with the dough will be done by the client. Verifying that the product is within specifications will be done during testing and evaluation procedures, and should not require any further verification once specifications are reached. Procedures for

cleaning the device will be evaluated and adjusted as necessary, and documentation will be provided to Earth Elements.

7.2 Food and Drug Administration (FDA)

7.2.1 The device's design needs to comply with FDA regulations. Therefore, the machine will be constructed of non-absorbent materials and parts with smooth surfaces to prevent food particles from becoming stuck and spoiling. All corners in parts that contact food will be rounded to make cleaning easier and act as another preventative for leftover food spoilage. Contaminate entry must be addressed to avoid metal shavings, hair, or anything else that may harm the consumer from mixing with the food. Harm to the user of the machine, whether by malfunction, improper use, or repetitive use, also needs to be evaluated.

7.3 Institutional Review Board (IRB)

7.3.1 The IRB either approves research, requires modifications in planned research prior to approval, or disapproves research conducted on human subjects. Should Perfect Mix Creations choose to use human participants in a survey or study to determine the success of its device, regulations outlined by the IRB will be followed. Perfect Mix Creations shall submit all required documents to the IRB before any research of this manner is conducted.

8. Acceptance Criteria

8.1 Our device's acceptability will be based on whether or not it increases cookie production at Earth Elements' bakery. The dispenser will be considered a success if it produces 900 or more cookies per day. Employees cannot consistently scoop such an amount every day due to the wrist strain it causes.

8.2 Aside from increased production, the client will evaluate our device based on its simplicity, size, cleaning ease, and cost.

8.2.1 The device must be simple to operate and use by any employee without additional training.
8.2.2 The device must be no larger than 18 by 36 inches in order to fit within Earth Elements' sink for cleaning.
8.2.3 Parts must be easily removable and minimal in number as the device will be washed at least once a day.
8.2.4 Earth Elements will spend no more than $1,000 on the device, but $200 to $500 is the optimal range.

9. Special Requirements

9.1 Software required for the device's creation includes either Pro-Engineer or Solid Works. Special software is needed only for the device's design, not the performance analysis. No special requirements will be needed for hardware except that it must meet federal and state food-processing requirements. Materials are available through local sources, and machines are available in various machine shops.

9.2 Employee training for the device's operation will include no more than a basic demonstration of its function. No specific certifications above food handling standard requirements will be necessary.

9.3 Travel requirements for this project will include trips to Earth Elements, grocery stores, and constructions and food processing labs. Additional travel outside these requirements is not expected.

Work Breakdown Structure

1. **Dough Dispensing Device**
    - 1.1 **Prototype**
        - 1.1.1 Acquisition of Dough
        - 1.1.2 Write-up of Testing Procedures
        - 1.1.3 Write-up of Testing Results
    - 1.2 **Construction**
        - 1.2.1 Gather Raw Material
        - 1.2.2 Fabrication of Components
        - 1.2.3 Assembly
    - 1.3 **Concept**
        - 1.3.1 Brain storm
        - 1.3.2 Check Patents
        - 1.3.3 Literature Search
        - 1.3.4 Review Relevant Standards
        - 1.3.5 Consider Current Products
    - 1.4 **Design**
        - 1.4.1 Determine Feasible Alternatives
        - 1.4.2 CAD Drawings
        - 1.4.3 Mechanical Analysis
    - 1.5 **Testing**
        - 1.5.1 Develop testing procedure
        - 1.5.2 Test Alternatives
        - 1.5.3 Testing Results
            - 1.5.3.1 Size of Product
            - 1.5.3.2 Size of Cookies
            - 1.5.3.3 Rate of Production
            - 1.5.3.4 Durability
            - 1.5.3.5 Cleanability
        - 1.5.4 Test Participants
            - 1.5.4.1 Ease of use
            - 1.5.4.2 Feedback
        - 1.5.5 Modify Alternatives
        - 1.5.6 Analysis of Results
        - 1.5.7 Final Design Determination
    - 1.6 **Management**
        - 1.6.1 Access
            - 1.6.1.1 DML
            - 1.6.1.2 BAE
            - 1.6.1.3 FAPC

1.6.2 Communication to Client
1.6.2.1 Current Process Information
1.6.2.2 Gather Opinion

1.7 **Costs**
1.7.1 Fixed Costs
1.7.1.1 Salary Costs
1.7.1.1.1 Salary of BAE Lab Workers
1.7.1.1.2
1.7.2 Variable Cost**s**
1.7.2.1 Input Costs
1.7.2.1.1 Dough
1.7.2.1.2 Sausage Press
1.7.2.1.3 Steel
1.7.2.1.4 Plastic
1.7.2.1.5 Silicone
1.7.2.2 Supplies
1.7.2.2.1 Machines
1.7.2.2.2 Welding Materials
1.7.2.2.3 Software
1.7.2.3 Labor Costs
1.7.2.3.1 Machining Costs
1.7.2.3.2 Lab Technician
1.7.2.4 Advertising Costs
1.7.2.4.1 Business Cards
1.7.2.4.2 Brochures
1.7.2.4.3 Display Booth Sign
1.7.2.4.4 Stationary
1.7.2.5 Transportation Costs
1.7.2.5.1 Fuel
1.7.2.6 Utilities
1.7.2.6.1 Electric Bill
1.7.2.6.2 Water Bill
1.7.2.6.3 Gas Bill
1.7.2.7 Depreciation
1.7.2.7.1 Depreciation on University Building
1.7.2.7.2 Depreciation on University Equipment
1.7.2.7.3 Depreciation on University Vehicles
1.7.2.8 Opportunity Costs

1.8 **Campaign Elements**
1.8.1 Business Card
1.8.2 Brochure
1.8.3 Web Site
1.8.4 Display Booth Sign
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Competitive Analysis, Research, and Investigations

1. Overview

1.1 Background

April Harrington founded her co-existing entities Earth Elements Farm and Earth Elements Market and Bakery (EEMB) in 1996. She initiated the businesses as a solution for eliminating as many chemicals as possible from her food products due to battling cancer for several years prior. Earth Elements' goal since has been building a local food system through preserving locally grown ingredients and providing them to the community. It utilizes crops grown on its own farm as well as those grown by other local farmers to produce quality, wholesome, "Oklahoma authentic" foods. While the company is not considered organic, it uses many organically grown ingredients in its products.

Earth Elements produces more than 200 products at any given time based on the seasonality of its ingredients. One of Earth Elements' major components is creating baked goods, such as spinach balls, meat balls, and cookies, from hand-scooped doughs or mixes. Cookies comprise the largest percentage of these goods, as employees hand scoop between 900 and 1,200 cookies each day.

1.2 Problem and Mission

Our client has opportunity for cookie-sale growth in existing and emerging markets, however, the company is limited to current production levels by time. Earth Elements employees cannot scoop any more cookies per day than they are currently. Several existing "cookie dispensers" have been tried with limited success. The dispensers either operated more slowly than hand scooping, required an excessive amount of cleaning, created too much waste, or produced inconsistent cookie sizes. The company needs a quick and efficient way to produce uniform cookies through a device that consistently dispenses the same amount of dough. It also needs new or revised promotional materials to help market its increased production.

At Perfect Mix Creations, we seek to provide solutions for our client through emphasis in product development and communications. Our objective is to create an innovative dough dispensing device collaborated with new marketing materials to make Earth Elements more profitable. Our dedication to excellence and professionalism makes us the "perfect" solution for this company's conundrum.

2. Industry Analysis

2.1 Overview

The Oklahoma foods industry is comprised of businesses around the state interested in selling and preserving locally grown or raised products. The industry goal either is met by selling local products directly to the consumer or by processing perishable products into other items such as baked goods. Our client has involved itself in both methods through developing her cooperating entities. Earth Elements Farm raises produce and EEMB utilizes that produce to create baked goods, canned goods, and entire entrees.

The current economic climate has had a significant impact on the statewide industry and Earth Elements. The recession-like economy has caused increased credit card debts, lower incomes, mortgage risks, and savings losses. According to the Third Quarter Economic Review through the Federal Reserve Bank of Kansas City,

> "Sweeping demographic shifts are challenging the growth of many rural communities in the Tenth District. The retirement of the baby boomers, coupled with the exodus of young adults, threatens to leave rural areas with a rapidly aging population and a shrinking local workforce. The strength of these demographic changes could hinder economic growth for many rural communities in the future" (Henderson and Akers 99).

As a result, industry growth has slowed. For example, Earth Elements experienced a 20 percent growth per month from 2006 to 2008 but now is experiencing a standstill. Although the company is not losing profit, its halt in growth is undesirable. Over the past five years, 60 to 70 percent of our sponsor's profits have come from Oklahoma Food Cooperative (OFC) sales. This leads to the conclusion that the current economy has prevented customers from buying through the cooperative as frequently, and its related sales have dropped. Oklahoma-food entities around the state are feeling similar trends in today's economy.

2.2 Regulations and Standards

The government regulates all materials that can come into contact with food. The different regulation agencies include the National Sanitation Foundation International (NSF), United States Department of Agriculture (USDA), American National Standards Institute (ANSI), Underwriters Laboratory (UL), and the Code of Federal Regulations (CFR). Standards affecting our group's project with Earth Elements are 21 CFR 110 and NSF Standards 2, 8, 51, 73, and 763. The NSF provides a product and manufacturer search to help individuals determine

whether or not a material is food-safe and what companies make it ("NSF Product and Service Listing"). All materials planned for our use, including stainless steel and plastic, can be made food-safe.

2.3 Gatherings and Publications

A few key gatherings exist for this industry. The OFC's annual meeting is held on January 31 for all member producers. Also, farmers' markets around the state are important to producers marketing and selling their locally grown or raised products. The Oklahoma Farmers' Market Alliance (OFMA) has weekly markets in Tulsa, Collinsville, Edmond, Jenks, Muskogee, Owasso, Bethany, and Stillwater.

Aside from gatherings, publications assist in communicating information between producers and consumers. *Farmers' Market Today* is a significant trade publication in this industry. Since its introduction in 2007, the bimonthly magazine has sought to make small farmers and farmers' markets more successful and profitable. It contains information and stories on what "growers, artisans, and farmers markets are doing to promote their businesses, reach new customers and develop value-added products" (*Farmers' Market Today*). The *Oklahoma Buy Fresh Buy Local 2009 Green Country Farmers' Market Guide* is another key industry publication. The ***guide*** lists markets, by county, throughout northeastern Oklahoma where shoppers can find locally-produced agricultural food and goods ("Buy Fresh Buy Local – Green Country"). "OK Grown" markets, where only produce grown in Oklahoma may be sold, also are noted in the publication. A similar publication in the Frontier Country region around Oklahoma City has yet to emerge, but the new Buy Fresh Buy Local chapter in that area is making plans for future promotions.

2.4 Resources

Key resources for businesses in the Oklahoma foods industry include local farmers and food-equipment dealers. Local produce and ingredients are available to industry businesses based on the season. Businesses within this industry must create their products around ingredients available at the current time. Materials used for processing (mixers, ovens, storage units, etc.) the local ingredients either are readily available and bought through specialized dealers or acquired second-hand through auctions or the Internet.

3. Customers and Buyers

3.1 Characteristics and Buying Practices

Earth Elements' major target market shops through the OFC, Oklahoma farmers' markets, and health food specialty stores. These customers are middle-aged and elderly individuals ranging from about thirty to seventy years in age. They are male and female and have at least high-school educations. The customers fall into middle or upper socioeconomic classes and are mostly Caucasian due to being geographically located in Oklahoma. They are concerned with purchasing healthy, "homegrown" products and supporting local, small farming operations. Customers value the fresh, non-preserved qualities local products ensure and appreciate the history behind each item. These customers take the added time of sifting through different local producers over the convenience of shopping at major retail grocers. Many are working or retired individuals with families.

Since the OFC comprises a majority of Earth Elements' business, most of its customers have buying practices and decision-making processes in line with the cooperative's purpose. The OFC only sells products made in Oklahoma and puts emphasis on customers being able to know exactly who grew their product, where their product was grown, and what practices the producer uses (*Oklahoma Food Cooperative*). So, Earth Elements' customers are looking for a locally grown, quality food product. A large percentage of the business's customers are repeat buyers who make orders every month. OFC orders open the first day of the month, and local farmers bring their products to Oklahoma City on the third Thursday. The cooperative's volunteer crew then sorts everything into customer orders, which are shipped to thirty-two pickup sites across the state (*Oklahoma Food Cooperative*). Each customer buys enough product to last until the next delivery date. The product amount depends on whether the customer is an individual or business, and product type depends on seasonal availability.

The prices of the OFC cookies are very reasonable for buyers as Earth Elements charges $4.00 per dozen for the small cookies. We are focusing on the smaller cookies since they are the main size sold through the coop and bring in the most sales. Since such a large amount of the company's annual profit, around 70 percent, come from the OFC, it is important to understand and observe the products with which the company has the best success.

The remaining customer base buys Earth Elements' products through farmers' markets or specialty stores. These buyers are more likely to purchase on a whim than the OFC customers. They browse through the company's products while shopping for several other items at the market or store. They may not be specifically looking for the Earth Elements logo. The

cooperative buyers put more thought into their purchases and who they want the items to come from due to the nature of the ordering process. So, Earth Elements has to cater to both mind sets.

A new target market for Earth Elements is emerging on Oklahoma State University (OSU) and University of Oklahoma (OU) campuses. These customers have slightly different demographic and psychographic characteristics than the business's previous target market. They are males and females eighteen to twenty-five years old in the process of obtaining college educations. These customers fall into the middle to upper socioeconomic classes but have limited expendable incomes. The target market is Caucasian as a majority but also includes black, Asian, and other multicultural races attracted to a university setting. The customers are geographically located either in Stillwater or Norman, Oklahoma, and generally are not providing for families. College students value low cost as a majority, but a growing trend in organic and all-natural products is arising. The value of more expensive, healthy products is in a battle with the average college student's expendable income.

The cookies targeted at this market are placed in high-traffic areas around OSU's campus. For example, some are available in a small café on the first floor of the library and others can be found in a café in one of the Classroom buildings where many classes are held each day. The small cookies are placed in bags and the large products are individually wrapped, which makes them easy for students to grab on the run. Another positive in having cookies for sale on campus is the ability for students to utilize their Bursar accounts and charge the items on their student IDs. April charges $1.39 for a six pack of these cookies, but OSU obviously marks the price up in its end retail value.

3.2 Market Size

The Oklahoma Food Cooperative currently has over 2,600 members. All members are potential customers for Earth Elements and represent the company's possible growth. Earth Elements currently averages between 300 and 500 orders per month. These numbers leave much of the cooperative population in untouched by the business.

Limited market research currently is available for small businesses like Earth Elements. A survey was conducted during the business's product sampling at OSU's campus on September 29, 2009. The survey questions were created through collaboration between our group and Ms. Harrington. The survey was conducted by Ms. Harrington, and the questions were asked verbally while the students sampled. Results are attached in Appendix A. Additional research

with larger numbers needs to be conducted on OSU and OU's campuses to generate a more accurate representation of the target market. Similar primary research also is needed from the target market utilizing farmers' markets and the OFC.

Consumers and other businesses learn of our sponsor's new products through OFC producer notes. These notes are published on a monthly basis on the cooperative's Web site in addition to a company description and full product line. The notes are sent in by member companies each time a new or renovated product is released. The business currently has no publications for new wholesale products. Consumers learn of these products by seeing them on the shelf. Creating awareness in this market could greatly increase Earth Elements' sales. The OSU and OU campuses are two markets Earth Elements is exploring and has a small share in. The "college scene" is emerging as a great market possibility and product demand is on the rise. Cookies, crackers, and granola are among the products provided in this market. Our group's machine will aid in the college market's expansion by fulfilling demand at the least expense possible.

3.3 Perfect Mix Creations' Market

In order to expand our sponsor's own customer base, Perfect Mix Creations has received the challenge of creating a quick and efficient way to create uniform cookies through a device that consistently dispenses the same amount of dough. So, we are looking at a different market than Earth Elements. Currently, the market for a cookie dispenser either is for large-scaled production or at-home use. Companies for large scale production include Rhodes Kook E King, CMC America Corporation, and Unisource Food Equipment. These companies sell machines that dispense multiple cookies, but they are large, heavy, and contain multiple parts to clean. Companies providing at-home cookie products include Pampered Chef, Russell Hobbs, and BonJour Cookie Factory. These companies offer either a scoop or press that handles one or two batches of cookies. Entities falling between large- and small-scale production currently are underserved by existing products. Small bakeries, catering businesses, and gourmet companies with midsized production have limited space, limited staff, and a large product variety. A small, simple-to-use-and-clean device that still produces many cookies is not available through companies handling large- or small-scale production. Earth Elements Farm has been in contact with other companies similar in size and production that also are interested in a medium-scale dispensing system.

The intended use of our potential product is to dispense raw cookie dough on to a baking pan in portioned amounts. The device should be simple and able to dispense small portions of any non-solid food product. The basic concept starts with a bowl for holding the dough and a hole in the bottom of the bowl from which the dough will dispense. A press will be positioned above the bowl to push dough through the hole. A cutter underneath the bowl then will separate the dough into appropriate portions. The device will function through an electric motor that operates the press and cutter. The pan underneath the cutter will be manually moved to catch the portioned dough and create three rows of four cookies.

4. Client Company and its Resources

4.1 Management Team

Five main positions exist in Earth Elements' management team. Lisa Weissenbuehler is the office manager, David Weissenbuehler is the packager, Sarah Shore is the sweets baker, Brian Thompson is the yeast baker, and Thelma Jones is the assembler. Three to four other "floater" positions are hired as the need arises.

4.2 Products

Earth Element's product line varies with the seasonal availability of ingredients since it utilizes only locally grown produce from its own farm and other surrounding farms. It produces baked goods, canned goods, jellies, jams, and all-natural body care products. Earth Elements provides over two-hundred different products on average, seventeen of which are cookies. The current product line is attached in Appendix B.

We are focusing on cookie production since it comprises the largest amount of Earth Elements' baked goods and requires the most hand work. Total cookie numbers produced each day depends on employee work hours. Many constraints accompany production both before and after cookies are put in the oven. Before baking, each cookie individually must be hand scooped, leveled, and placed on the cookie sheet. The second constraint is the actual baking. The company's small oven can handle either eight-dozen small or four-dozen large cookies, while the large oven can bake either twenty-dozen small or ten-dozen large cookies at a time. Once the baking is complete, packaging then becomes the final constraint. Different packaging types require different product amounts and sizes, so cookies must be sorted. Since it would be difficult to improve the second or third constraint without applying large amounts of additional

capital, we will focus on simplifying and speeding-up the first step of this process. Our efforts should allow Earth Elements to increase production while keeping labor and input costs constant.

4.3 Inputs and Distributors

Ingredient inputs (wheat, flour, produce, etc.) are acquired both internally from the company's farm as well as from local farmers across the state. Whatever the company does not grow itself, it seeks from other local producers. Inputs not found locally are bought from Braum's or Sam's Club. Earth Elements purchases used equipment from small estate auctions and other local auctions for its baking and cooking inputs. The different kitchen utilities include mixers, bowls, knives, ice cream scoops, cookie sheets, and ovens.

Earth Elements utilizes a number of different small distributers. The main distributer is Urban Agarian, which delivers to farmers' markets as well as the OSU and OU campuses. Matt Burch is specifically used to deliver products to small restaurants around the state. Other distributers perform specific deliveries depending on the region they are located in and the current product line. The going rate charged for delivery is between 2 and 5 percent, but the rate decreases as the shipment volume increases.

Local farmers and distributors are key people in Earth Elements' success. The business's key current customers include people at Oklahoma farmers' markets; several restaurants and grocers Mr. Burch delivers to in Guthrie, Oklahoma; Native Roots Market in Norman, Oklahoma; Crescent Market in Nichols Hills, Oklahoma; The Health Food Center in Oklahoma City, Oklahoma; Oklahoma State University; and the University of Oklahoma.

4.4 Financing

Earth Elements uses a costing program for its products costs and profits. Costs are plugged into the computer, and it generates a cost analysis. Ingredient costs run at twelve cents per ounce and packaging costs include twenty-five cents per box, seventeen cents per pouch, and three cents per label. Due to the company's profit margin, it wants to spend between $200 and $500 on our group's cookie dough machine.

Earth Elements' lack of growth and small-business status are affecting its current business decisions. To improve its financial condition and cash flow, the business is developing an at-home delivery system for its products. The company's distributors will have a list of households to which products will be taken. Such distribution straight to the consumer is intended to reduce unnecessary expense. The service will be launched November 1.

4.5 Marketing and Promotions

Product marketing is done in-house by Ms. Harrington. She served as a graphic designer for ten years prior to opening Earth Elements. The company currently has existing business cards, brochures, display signs, and product labels. Earth Elements' Web site was lost at one point due to a server complication. The current site simply consists of the recovered files posted onto the OFC Web site. It contains no real design, just a long list of product pictures and prices. The company is open to all suggestions and revisions for a new promotional campaign.

Earth Elements' current logo was designed by Ms. Harrington. She does not want it altered in any way due to the recognition it provides for her products. Ms. Harrington commonly tells potential customers to look for the "green bullet" to find her products. The logo is supposed to bring to mind her company's reputation of producing wholesome, Oklahoma-grown products. Ms. Harrington wants her products to be associated with preserving locally grown ingredients and her ultimate goal of building a local food system. The two entities have slightly different logos. The logo utilized by our client for promotional purposes is attached in Appendix C.

5. Competitors and their Resources

Several local businesses compete for customers in Earth Elements' target market. These businesses include Persimmon Hill Farm, 1 Smart Cookie, Dara Marie's Boutique & Bakery, Prairie Thunder Baking Company, Upper Red Fork, Mother's Catering, Granny, The Prairie Gypsies, and Renrick's Family Recipes. Limited market research is available on small businesses. However, the OFC Web site and Renee Albers-Nelson, OSU Food and Agricultural Products milling and baking specialist, helped provide information on each competitor. A summarization of the compiled facts is located in Appendix D.

After unsuccessful attempts to locate any further data on Earth Elements' competitors, we have decided to conduct a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis on the current and potential process of baking cookies. The current process can be considered competition to Earth Elements as it is how the company's competitors also currently make their cookies. The current way consists of an employee scooping the dough by hand with a scoop and then scraping off the excess dough to keep the size uniform. Whenever this process is used, a worker can make between 900 and 1,200 cookies maximum per day. One problem with this process is the fact that the dough is handled more than is ideal. With our potential new dough dispenser, more cookies can be made in a cleaner and more health-conscious manner. The

ability to make more cookies becomes a financial benefit to Earth Elements as it has a growing market for that product.

When conducting a SWOT analysis on the potential and competing processes, Weaknesses and Opportunities should receive emphasis in analyzing competition. The reason for this is because they are internal weaknesses currently and potential opportunities in the future. The current process's biggest weakness is time consumption. Whenever employees are spending an entire day making cookies at a rate that could be more efficient, it is causing high opportunity costs. The opportunity cost is the best alternative solution that is available. If another way exists to make cookies faster with fewer labor costs, then it can be considered the opportunity cost.

There also can be opportunities to look at in the new system. A major opportunity is the potential for consistent sales to the OSU campus. Once again, Earth Elements can send larger amounts of cookies to campus and meet OSU's demands if the company can increase production. Another opportunity available for our client arises from labor opportunities. If it takes less time for the new system to make the same amount of cookies, employees can spend that saved time working in other areas around the bakery. The potential system could provide a more efficient way for Earth Elements to spend its labor costs.

In a complete SWOT analysis, the Threats of the new system must be looked at as well as the current Strengths. One threat of having this new system could arise on the technical side. If the new system fails to make all the cookies the same size, employee may fail to notice as quickly due to the enhanced production rate. Since there are several possibilities in how the new system may operate, the system may require more skill than just scooping dough out of a mixing bowl. This is where a current Strength of the process arises. Our client knows all of its currently produced cookies are going to be uniform because employees scoop each cookie individually. The same person scoops the dough, scrapes it off, and bakes it in the same manner for each batch.

6. Technical Analysis

6.1 Scientific Literature Review

Current products existing in the market, such as Kook-E-King, are unable to meet Earth Element Farm's needs for several reasons. Cost is the largest issue with the products since the company is a small business and cannot afford the high cost of large and complex machines.

Although the larger machines can produce a high number of cookies, they are not an option due to cost. Other affordable machines, such as those offered by Pampered Chef, are not practical because of the cookie number produced by Earth Elements and the extended amount of time and work required to clean the device. Another issue with smaller dough machines is inconsistency in cookie size. For example, the bench model Kook-E-King produces very large cookies when the hopper is full due to the weight of the dough. However, cookie sizes become smaller and smaller as the hopper empties.

Durability, reliability, maintenance costs, and programs vary widely with the type of machine and company. For example, large companies provide classes to show owners how to operate large, computer-based machines, where as the personal, hand-held gun comes with a simple instruction booklet.

Characteristics of a cookie cutting device are limited only by a person's imagination, but the usefulness of the device is not based solely on the fact that it works. Most patented and workable cookie-cutting machines are not being used because they are overly complex or difficult to clean. Such machines include components like robotic arms used to scoop portions of dough from the mixing bowl or high pressured streams of water could to cut portions off a log of cookie dough. While creative, these options are unnecessarily complex.

When dealing with food processing equipment, issues of keeping the food contaminate free are a big concern. All parts that come in contact with the food must be smooth, nonporous, and nonabsorbent. Parts like bowls and tubing must not have any square corners. Instead, they must have a radius corner to prevent food from collecting in sharp corners and spoiling. Construction materials must not react with the food and must be corrosion resistant. Acceptable materials include stainless steel, titanium, glass, plastic, and ceramics (Schmidt). Inspection of new food processing equipment designs is done by the Food and Drug Administration (FDA), which follow the Current Good Manufacturing Practices (cGMPs) outlined in the Food, Drug and Cosmetic Act. This act covers bakery personnel, plant and grounds, sanitary facilities and processing. cGMPs are the standard for designing properly cleanable food processing equipment. Food processors can be prosecuted for not following such provisions (Prejean).

6.2 Patent Searches

We discovered five patents relevant to our proposed cookie machine. Our assessment of each patent is included in Appendix E. Each patent's abstract, claims, and drawing sheets can be found in Appendix F. Our research revealed no relevant patent infringements for our prototype design.

6.3 Current Process

Currently at Earth Elements, ingredients are gathered and blended in a mixing bowl, hand scooped onto cookie sheet, and baked. The only time the dough is frozen is when a batch has not been completed at the day's end or when it is marketed as frozen dough for home cooking. The current process is diagramed in Figure 1.

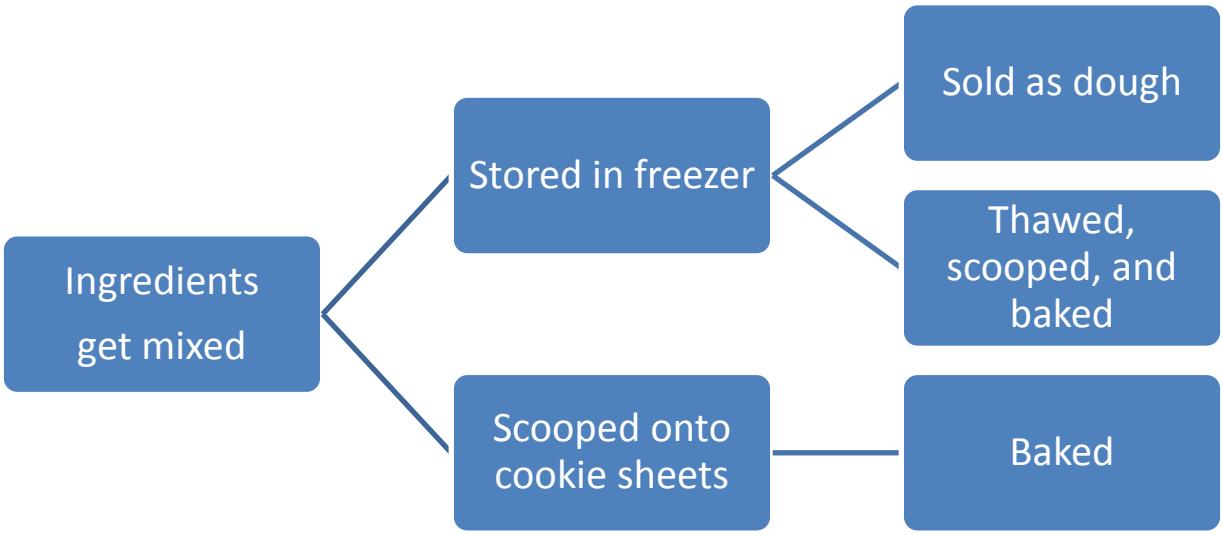

Figure 1: Current Process

6.4 Proposed process

We propose a device that will dispense dough instead of portioning the dough through manual scooping. The bowl with the mixed ingredients will be secured onto the proposed device. After mixing, the dough then will be dispensed through a hole in the machine by a crank shaft or electric motor. Dough will be separated by a wire cutter into the correct portions. The uncooked cookies then will be placed on the baking sheet. The proposed process flow is shown in Figure 2.

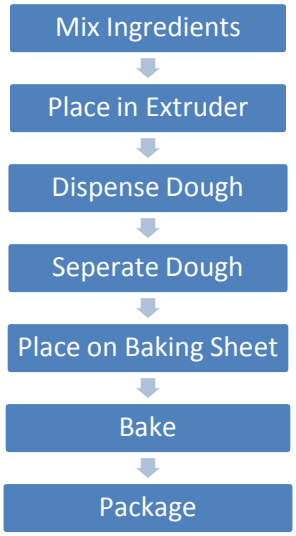

Figure 2: Proposed Process

6.5 Lab Experiments

Experiments soon will be conducted to begin designing Earth Elements' new machine. We will start by testing the viscosity of the cookie dough and the amount of force needed to extrude the dough through various sized holes. Physical testing and data collection will include changes in production speed, varying cookie sizes, speed comparison between production with and without the device, easiest input method determination, durability testing, and cleanability.

Three-dimensional CAD drawings will model the proposed system. Animated simulation of the device will be produced using the CAD software. From a bill of materials, the parts will be drafted to scale and sent to the DML or BAE shops for fabrication. To demonstrate the setup, a small prototype of the device will be made. We will ask a group of people unfamiliar with the device to operate it and provide feedback on the ease of use in order to simulate how the system will work at Earth Elements. Modifications then will be made based on the feedback.

Environmental, Societal, or Global Impacts

The production of our design is unlikely to affect any global market. The probability of our device taking off and being distributed worldwide is minimal. It is a device for medium-sized businesses like Earth Elements, which does, however, lead to environmental and societal impacts.

Several medium-sized Oklahoma bakeries have expressed an interest in a product like we intend to create. Should our device prove a success, it will make those businesses more profitable. Added profit would allow the companies to expand productivity and maximize their growth. The medium-sized companies then either could become a larger-scale entity or could maintain their current size and produce the highest quality products possible. In either case, the expansion of medium-sized bakeries around Oklahoma would lead to a definite impact on the area's environment and society. The increased bakery production would cause a higher demand for raw ingredients used by the companies. Area farms and other suppliers of the ingredients would have to produce more crops to meet the growing demand, and a resulting impact on the farmland and surrounding environment could be felt. Also, the families of the growing bakeries would feel a societal impact of increased income. Individuals who may have fallen into the lower or middle income range could possibly find themselves at a higher economic and societal status through the use of our product.

Overall, the success of our design could have a measurable influence around Oklahoma. Rural Oklahoma's environment and the society of individuals operating middle-sized bakeries are likely to be affected by our proposed device.

Engineering Specifications

1. Definition of Customer Requirements

We need to create a product that portions dough efficiently in constant amounts and in a constant formation. The product should be easily cleanable in the company's sink, so the largest size it can be is 18" x 36". The cost can be negotiated, but it must be under $1000 with $200 to $500 being ideal. The dough needs to be dispensed faster than the current production rate to accommodate the recent increase in sales. The dough dispensed needs to be spaced appropriately to drop the dough on a sheet in four rows of three cookies each.

2. Engineering Specifications

Beyond the customer requirements, the device must meet codes and regulations for food processing. Regulations and codes this device must meet were put forth by National Sanitation Foundation International (NSF), United States Department of Agriculture (USDA), American National Standards Institute (ANSI), Underwriters Laboratory (UL), and the Code of Federal Regulations (CFR). Standards affecting our group's project with Earth Elements are 21 CFR 110 and NSF Standards 2, 8, 51, 73, and 763.

The FDA's Food, Drug, and Cosmetic Act has a section of Current Good Manufacturing Practices is the standard for designing properly cleanable food processing equipment. To prevent the contamination of the dough, all contact points must be smooth. Bowls and tubes must have not any corners or creases for food to become stuck.

The materials used are steel and plastics of food-safe quality to prevent reaction or corrosion in the materials under normal use. The materials also must be nonporous and nonabsorbent, which food-safe plastics also are.

Proposed Media/Communications Plan

1. Core Campaign Problem

Earth Elements Market & Bakery (EEMB) needs a more modern, simple, and cohesive design in its collective campaign. The graphic appeal of its existing promotional materials is detracted from due to the overwhelming and cluttered presentation of information on each element. In addition, many of the elements are outdated.

2. Existing Campaign Elements

EEMB currently has a logo, product labels, a business card, a promotional brochure, a Web site, and display signs. The company has an existing logo and does not want it to be altered. Earth Elements feels it has built brand recognition around its "green bullet," and has spent several years modifying the logo to its present state. Its current design and color scheme can be seen in Figure 3. Aside from the logo, Earth Elements is open to all other promotional suggestions and revisions.

3. Proposal of New Campaign Elements

We propose creating a new, cohesive design in all of EEMB's existing campaign elements. The only thing currently tying them together is the company logo. We plan to build off the green and white colors used in the emblem. Additional accent colors and type fonts will be explored to represent the organic, wholesome, and local feel the company seeks to portray. Once a finalized color scheme and design concept is decided, they will be applied to all elements of the marketing campaign.

We will use EEMB's product labels as the "beginning glue" in unifying the elements as they are currently receiving the most public exposure. The current label can be seen in Figure 4. Brand and product recognition is extremely important to a business's success, so we want to Earth Elements' promotional materials to match its products.

Next, we will address the company's business card and brochure. Both materials contain numerous different text fonts, color schemes, and information groupings. The business card is printed on a different paper color and weight than the brochure and also contains too much information. The point of a business card is to relay a company's name, brand, slogan, and contact information as succinctly and uniformly as possible. The brochure was created in 2006 and contains currently irrelevant information. It also contains an overwhelming amount of

information presented in a disorganized manner, like the business card. Additionally, the pictures could be updated to convey a more professional vibe to the observer. Overall, we intend to unify, modernize, and organize the existing business card and brochure.

EEMB's Web site was lost at one point due to a server complication. The current site simply consists of the recovered files posted onto the Oklahoma Food Cooperatives Web site. It contains no real design – just a long list of product pictures and prices. Positive Internet exposure would greatly benefit our client and expand its customer base. We intend to create a completely new site that matches the other existing campaign elements in its graphic appeal and consumer message.

Our final revisions will be conducted on Earth Elements display signs. The company currently has larger signs for its booths at local farmers' markets, however, no smaller signs exist for product displays at convenience stores or other distribution points. As seen in Figure 5, the company's products have plenty of space in most of their display shelves across Oklahoma State University's campus for a small sign. We intend to create such an element to differentiate EEMB's products from others in the stores and to attract a potential customer's attention as he or she passes by.

4. Campaign Element Costs

Price is an important consideration for EEMB's campaign elements. It is a small business with limited resources for promotional materials. All materials have been produced in-house up to this point due to the owner, April Harrington, having a graphic design background. In-house production has allowed the company's marketing costs to remain minimal. Therefore, price restrictions will dictate much of our design including printing colors, paper choices, and production numbers.

Figure 3

Figure 4

Figure 5

Proposed Business Plan/ Financial Analysis

1. Financial Statement

One of Perfect Mix Creations' largest goals for this project is to make a financially stable decision for our client. Should our proposal fail to make Earth Elements more profitable, it must be re-evaluated.

2. Calculating Profits

Since our design proposal mostly affects cookie amounts sold, our focus will be on cookie profits. Earth Elements currently sells its small cookies at $1.39 per six-pack to Oklahoma State University. Although the amount sold per week currently is inconsistent, room for growth is apparent in this market. Other small cookie sales take place through the Oklahoma Food Cooperative for $4 per dozen. Currently, Earth Elements can produce a maximum of 900 to 1,200 cookies per day. These high numbers only are obtained on an extremely productive day when an employee focuses solely on cookie production. Such production does not occur daily due to the amount of strain it causes on an employee's wrists and the need to bake or create other products. Therefore, Earth Elements would consider our device a success if it could produce more than 900 cookies per day. This would create a profit of at least $208.50 per day depending on the exact amount produced and the intended buyer. Such a production increase coupled with a growing market would make our device economically beneficial to Earth Elements.

Another aspect of calculating profit is the potential for cutting cost, with two major areas including distribution and labor costs. Earth Elements' distributors charge from 2 to 5 percent of the company's sales for product delivery. The percentage varies depending on shipment size – the larger the shipment, the lower the charge. If the company consistently sends larger shipments around the state, it will be charged consistently less for delivery. The decrease in labor costs can be calculated by how many "man hours" it takes to mix and create a given amount of cookies. As stated earlier, one employee can produce a maximum of 900 to 1,200 cookies a day. An increase in production will cause the amount of cookies per man hour to rise and, therefore, decrease the labor dollars spent per cookie.

3. Cost Versus Benefit

The new system's benefits can be measured by the rate at which cookies are scooped. In a test done by our engineers, hand scooping was conducted at a rate of 12 cookies per minute.

The sausage press, which is a major component of our proposed prototype, made approximately 16 cookies per minute. The benefit of increased production must be weighed against the cost of the system. The prototype's total cost is estimated to be $645. Labor hours play a major factor when evaluating this cost versus the benefit of increased production. Earth Elements' employees make between $8 and $9 per hour. At these rates, the proposed prototype must save approximately 76 labor hours to justify its cost. Our machine possibly could produce up to 1,920 cookies in an eight hour day since it is projected to make 4 cookies per minute more than the previous process,. Depending on the amount of cookies needed each day, our device enables more time to be spent in other areas of the bakery. For example, if a limit of 1,000cookies per day were to be set, the new process could make those cookies approximately 2.5 hours faster throughout the work day. The resulting extra time around the bakery would allow employees to be more diligent with other tasks. Additional factors such as employee satisfaction and productivity may also be improved by producing cookies at a faster rate.

Design Concept Evaluation

Each method examined reduces employee exposure to the dough by eliminating as much handling as possible. The alternatives also are versatile in the sense that other mix types, such as meat and spinach balls, can be produced with the devices. All of the concepts have the option of either hand or motor operation.

1. Sausage Press

This design concept is based on a sausage press. The theory is to press the cookie dough through an opening like a sausage press presses ground meat through an opening in the side of its container and into tubes for linked sausage. The press operates by the user hand cranking a plate down a cylindrical bowl until dough is funneled through a hole in the bottom. The idea for this design is to modify the press to push cookie dough rather than ground meat. The modification allows the dough to go through the bottom of the container as opposed to the side. Once the dough is pushed through the cavity, a thin wire moves back and forth under the bowl to cut the dough into portions. The entire process for this machine includes:

1. moving the dough from the mixing bowl to the straight-sided bowl,
2. placing the straight-sided bowl under the press,
3. pressing the dough through the opening,
4. separating the dough with a wire once a specific amount is pressed out, and
5. allowing individual cookies to fall onto a baking sheet.

A motor can be added to make this device automatic, which means the operator only has to move the baking sheet. This is a very simple machine to use but requires the dough to be moved from its original mixing bowl into the press's straight-sided bowl. Items to clean include the mixing bowl, straight-sided bowl, stopper, and wire. The machine would be simple to manufacture and contains very few parts. This design is proposed for further review because of its ease in manufacturing and use.

2. Using Mixer

The original concept was to modify the current mixer. The modification would involve creating an attachment that will press the dough down through a mixing bowl with a hole in the bottom. The process of the dough through this machine included:

1. mixing the dough the bowl,
2. removing a plate from the bowl,
3. replacing the mixing paddle with a press,
4. pressing the dough through the hole in the bottom,
5. cutting the dough with a wire, and
6. allowing individual cookies to fall onto a baking sheet.

The bowl in this design must be modified with holes in the bottom along with a plate to hold the ingredients while mixing. The cutting apparatus is similar to that of the sausage press concept. This device would be automatic, and the operator would move the cookie sheet to catch the dough. Additional items for cleaning would include the attachment press, the plate, and the wire. The attachment would be very difficult to manufacture because it would consist of a circular disk moving within another disk. The mixer paddle not only rotates but moves circular around the bowl, so developing a press to fit the current machine would involve too many modifications. This method is not feasible because of the difficulty in manufacturing the attachment.

3. Flip Method

This method consists of having a separate machine to push the dough out of the mixing bowl explained in the previous method. The process of the dough through the machine includes:

1. attaching a plate to the top of the bowl,
2. flipping the bowl over and placing it on a press,
3. securing the bowl on the machine,
4. pushing the dough out with the press,
5. separating the dough with a wire that goes back and forth, and
6. allowing individual cookies to fall onto a baking sheet.

This technique has the possibility to leave a large amount of dough in the bottom of the rounded-bottom bowl the bowl. However, three to four cookies could be produced at a time. The items to clean for the method include the bowl, the plate, and the wire. The problems created by this method are the size of the machine and the manual effort of flipping over a bowl filled with dough.

4. Side Pusher

This method uses the mixing bowl and a separate machine. The machine would press the dough out of the bowl, and no bowl modification would be required. The operation would include:

1. placing the bowl sideways on the machine,
2. securing the bowl onto the machine,
3. utilizing a half-moon press to push the dough from the top to the bottom,
4. the dough being fed downward to an opening,
5. separating the dough into equal portions with a wire, and
6. allowing the unbaked cookie to fall onto the baking sheet.

The device would take up a large amount of space and be complex to operate. Also, large dents in the bowl would lead the machine to jam. Items to clean for the method include the bowl, wire, press, and hopper. This method only produces one cookie at a time and would be reasonably difficult to machine.

5. Scooper

This machine would automatically scoop the dough out of the bowl and place it on the cookie sheet. It would be similar to a robotic arm. The operation would include:

1. hooking the machine to the bowl,
2. the machine scooping individual cookies, and
3. the cookie ball being placed on a baking sheet.

The method is hard to machine, requires someone to push the dough towards the scoop, and leaves an excess amount of dough. The items to clean would be about the same as the current process, but the machine would need to be disassembled and re-assembled for every batch. This method would not be feasible because of the high manufacturing costs and difficulty.

6. Rolling Cutter

Another method is to place the dough on a conveyer and have the cookies are cut out. A rolling-cutter design utilizes a “squirrel cage,” and its operation would include:

1. placing the dough on a conveyer,
2. allowing the dough to be fed to the roller,

3. the roller cutting out each cookie,
4. the cookies moving to the baking sheet, and
5. Excess dough falling off the conveyer belt.

Large volumes of cookies can be produced with this device, and the cookie sizes and shapes will be consistent. However, the entire machine, including the large conveyor belt, would need to be completely disassembled and cleaned after each use. This design was not considered feasible mainly due to the machine's large size and creation of additional clean-up.

7. Continuous Dough Log Cutter

For the continuous dough log cutter, dough is extruded onto a conveyor belt in a continuous stream. The dough then passes under a cutting blade. The device's entire process would include:

1. placing the dough in a hopper,
2. allowing the dough to feed downward,
3. the dough being extruded onto a conveyor,
4. a blade cutting the dough into the individual cookies, and
5. the cookie slices being manually taken off the conveyer and placed on a baking sheet.

This method provides a high volume of cookie output and a mostly automated process. However, the machine would be large, cumbersome, and contain many parts to clean. Cleaning would require the machine's disassembly. Due to these problems, the method was not considered for further evaluation.

8. Hand-held Extruder

One possibility is similar to what is currently available to the "home cooking" market. The idea is to have a hand-held extruder loaded with dough push out individual cookies. The process of the operation would include:

1. placing the dough in the tube,
2. pressing the dough through the opening, and
3. closing the opening by releasing the hand trigger.

The positive aspects of this method are the allocation for accurate placement of individual cookies onto the cookie sheet and the device's small size. However, the device would need to be completely disassembled to be cleaned. This method was not considered further due

to the repeated use of the device causing its user to tire. Adding a motor or other power source would eliminate this problem but likely would entail a large amount of machining. Also, the amount of cookie dough the machine could handle would be small, resulting in excess down-time for refilling.

Proposed Schedule and Gantt Chart

Prototype Budget Proposal

1. Costs Overview

The budget for the prototype includes input costs incurred through constructing and testing the device. Costs will be paid for by the budget given to our group through the Innovations class in addition to money allotted by Dr. Holcomb. All costs will be recorded to keep track of the money spent on the prototype. Earth Elements ideally seeks to spend between $200 and $500 for our finalized product, however, we realize the synthesis and testing of a prototype will cost much more.

2. Cost of Materials

The finalized construction material for the prototype has yet to be determined, but our group recently visited Lowe's to examine different materials and prices. After speaking with Dr. Weckler during the visit, we have decided to search for some of the materials through McMaster-Carr's Web site. The company has more than 480,000 products, including hand tools and raw materials. The site gives the prices with the quantity per package and also allows partial packages to be purchased.

In addition to purchased materials, our group also has access to supplies in Oklahoma State University's Biosystems and Agricultural Engineering (BAE) construction lab. The lab has bins of scrap metal that can be used for fabrication. Such materials will not add to expenses as long as the scraps already have been disposed of in the bins.

3. Testing Costs

The price for testing our new prototype can be minimized in several aspects. A sausage press has been purchased to use for testing purposes, to be modified as a part of the prototype, or possibly to fulfill both purposes. Another major testing input is the dough produced by Earth Elements. Our client has provided us with this input free of charge. We also have access to several locations including the BAE lab, the Design and Manurfacturing Lab (DML), and the Food and Agricultural Products Center (FAPC) at which testing can be conducted. The sites are provided at no cost and have several tools available for various testing procedures.

4. Final Budget

All prices have been compiled to propose the final budget. Items taken into consideration for prototyping include:

- “scoopers” comparable in size to Earth Elements’ for output comparison,
- a sausage press for examination and modification,
- wire for cutting the dough,
- motors, gears, and wire for automation, and
- Plexiglas and stainless steel for testing other alternatives.

While it is necessary for all purchases to take place and be recorded for a final calculation, we have estimated a total prototype cost of $645. The price break-down can be seen in Table 1.

Table 1: Proposed Budget

Item	Quantity	Cost/Item	Fall 09	Spring 10
Sausage Press	1	$200	$200	
Scooper	2	$15	$30	
Motor	2	$15		$30
Wire		$5	$5	
Plexi-Glass	3	$30		$90
Connection Hardware				$60
Bowl	1	$50		$50
Gears				$100
Electrical Hardware				$30
Stainless Steel	3	$5		$15
Miscellaneous				$35
		Costs	$235	$410
		Total Cost		$645

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Appendix A: Earth Elements Survey

Appendix B: Earth Elements Product List

Appendix C: Earth Elements Logo

Appendix D: Competitors and Their Resources

Appendix E: Patent Evaluation

Appendix F: Relevant Patents

Perfect Mix creations

Dough Dispensing Device for Earth Elements Market and Bakery

December 4, 2009

Mission Statement

At Perfect Mix Creations, we **fix** our clients' "mixed-up" **business headaches**. Through **emphasis** in communications and product development, we create **innovative** solutions to make **your company** more **profitable**.

Our dedication to **excellence** and professionalism makes us the perfect **solution** for your next company conundrum.

Problem Statement

Earth Elements Farm needs a **quick** and **efficient** way to create uniform COOKIES through a device that **consistently** dispenses the same amount of dough.

The company also needs **new** or revised **promotional** materials to market its products.

Fall Semester

- Analyze and define the problem
- Develop a WBS and task list
- Proposed media and communication plan
- Business analysis
- Generate design concept
- Design prototype
- Develop a schedule
- Develop a budget

Perfect Mix reations

SOLUTIONS

Business Analysis

Competitive Analysis

Industrial Analysis

- Federal Reserve Bank of Kansas City
- Decrease in industry growth
- Earth Element
  - 75% growth over the past five years
  - 2009 no growth

http://www.okgrown.com/

Competitive Analysis

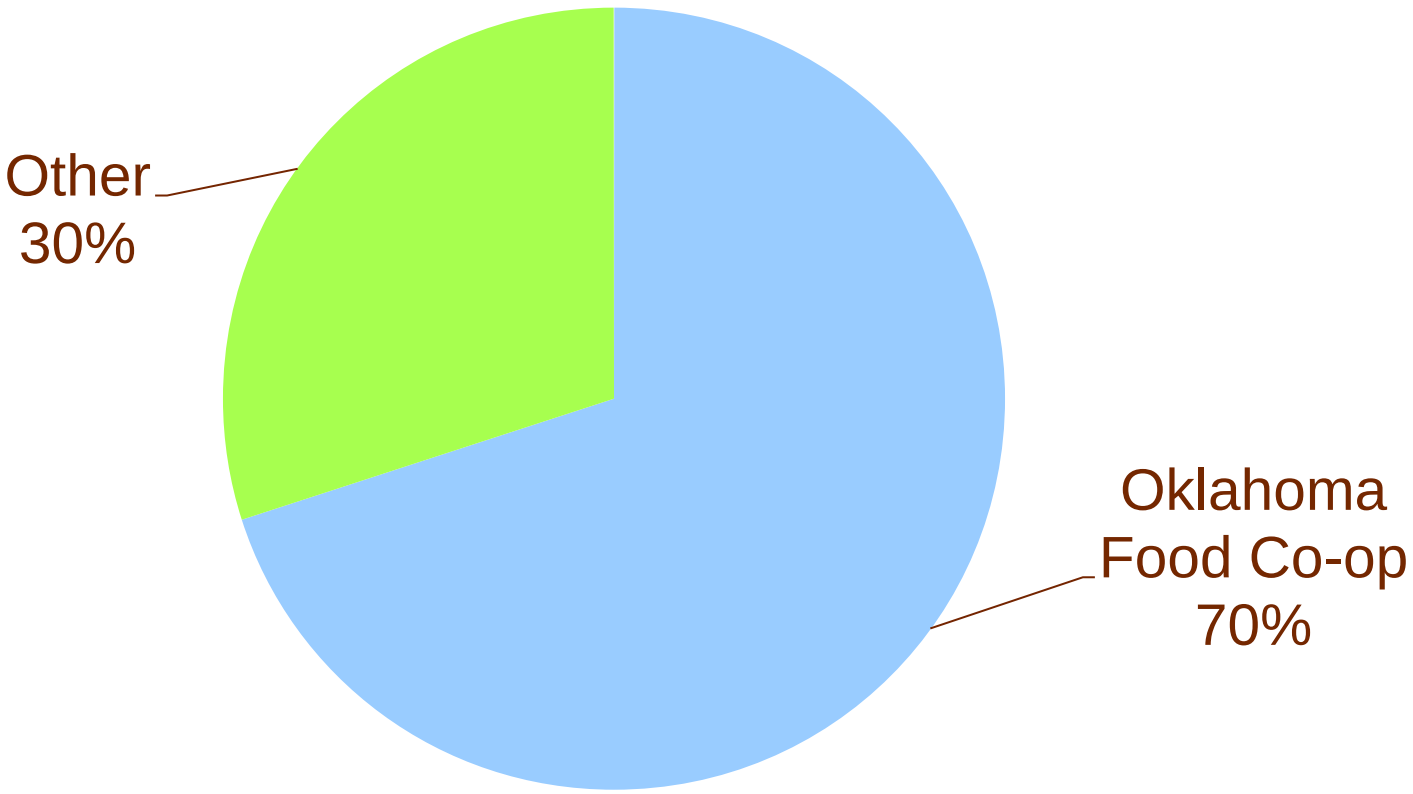
Customers and Buyers

- Oklahoma Food Co-op
  - 300 to 500 orders per month
- Specialty Stores
  - Guthrie Restaurants and Grocers
  - Native Roots Market (Norman)
  - Crescent Market (Nichols Hills)
  - Health Food Center (Oklahoma City)
- Farmers' Markets
- College Campuses
  - Oklahoma State University
  - University of Oklahoma

Competitive Analysis

Customers and Buyers

Annual Sales Breakdown



Competitive Analysis

Client company and resources

- Products
  - Locally grown
  - Seasonal ingredients
  - over 200 on average
  - 17 are cookies
- Cost
  - prototype vs. labor
- Benefit
  - increased production
  - Increased profits

Competitive Analysis

Competitors and resources

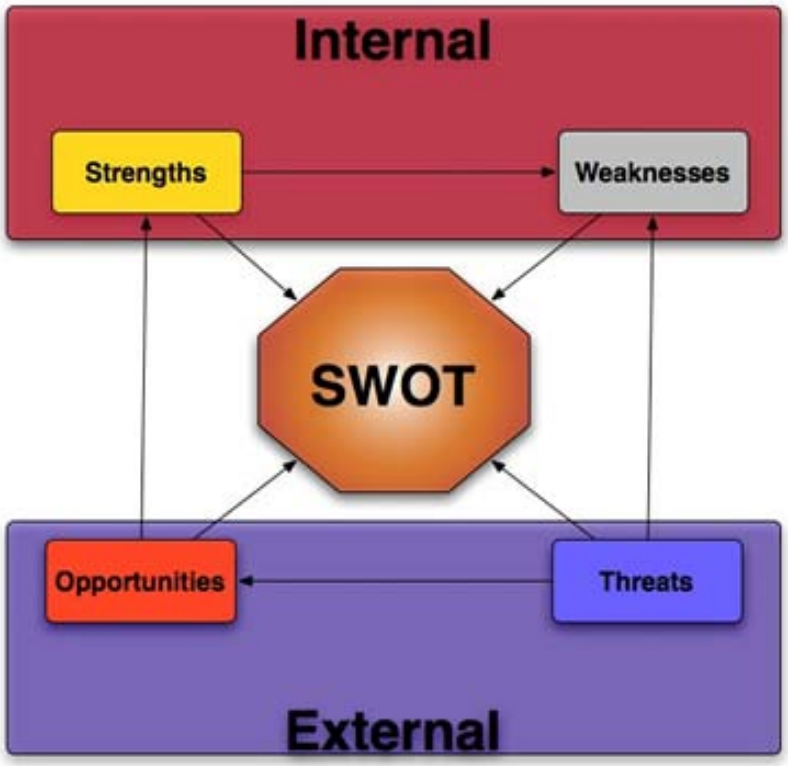
Business Name	Location	Product Line	Distribution / Marketplace
Persimmon Hill Farm	Stillwater	pies, breads, candies, pastries	Ok Food Co-op, Stillwater Farmers' Market
Dara Marie's Boutique & Bakery	Norman	variety cookies, restaurant entrees	storefront
Prairie Thunder Baking Co.	OKC	breads, pastries, restaurant entrees	storefront, wholesale, preorders
Upper Red Fork	Hunter	100% whole wheat cookie dough	Ok Food Co-op, farmers' markets
Mother's Catering	Norman	deli items, baked goods, specialty items,	Ok Food Co-op
The Prairie Gypsies	OKC	gourmet products, casseroles, pizzas	Ok Food Co-op, catering service, local markets, online, specialty stores

Competitive Analysis

Competitors and resources

SWOT Analysis

- Strength
  - simple process
- Weakness
  - large labor force
- Opportunity
  - higher productior
- Threat
  - waste



http://hrmadvice.com/assets/images/swotanalysis.jpg

Perfect Mix reations

SOLUTIONS

For Dispensing Dough

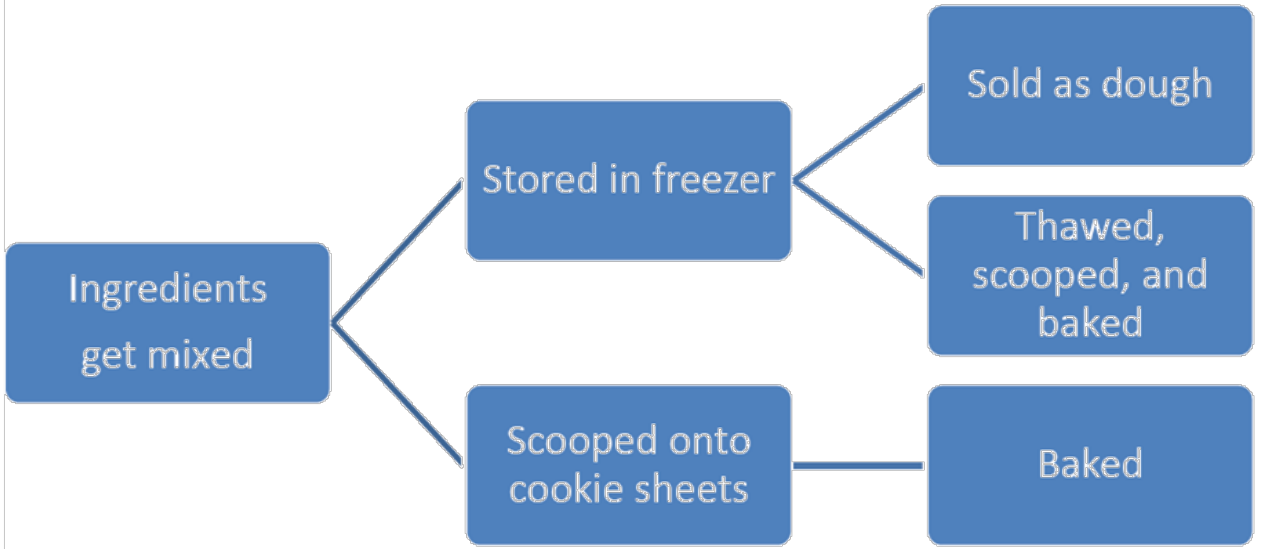
Applicable Standards

- Hazard Analysis and Critical Control Points (HACCP) Plan
  - description of food
  - flow chart of cookie production
  - critical Control Points established
- Food and Drug Administration (FDA)
  - non-absorbent materials
  - smooth, rounded surfaces
  - avoid entry of contaminates

Client's Criteria

- Deadline: May 7, 2010
- Design production: 900 cookies/day
- Consistency in size and shape of cookie
- Simple operation
- Maximum size: 18" x 36"
- Minimal amount of parts
- Easy to assemble and disassemble

Current Process

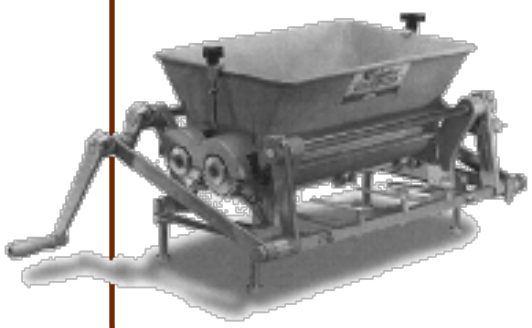


Problems

1. time consuming
2. labor intensive
3. portion control
4. waste

Current Companies

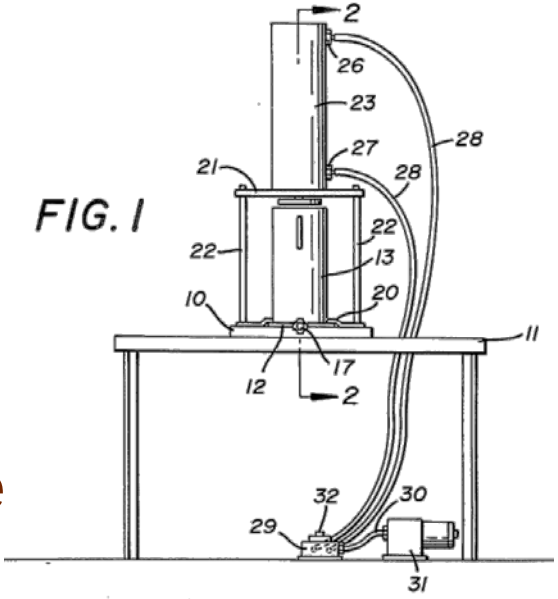
- Large systems
  - Kook-E-King
  - CMC America Corporation
  - Unisource Food Equipment
- Personal use
  - Pampered Chef
  - Russell Hobbs
  - BonJour Cookie Factory

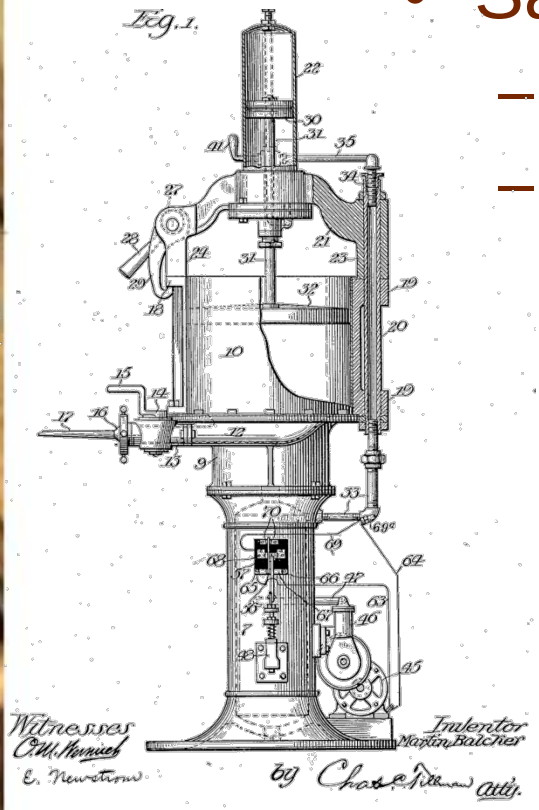


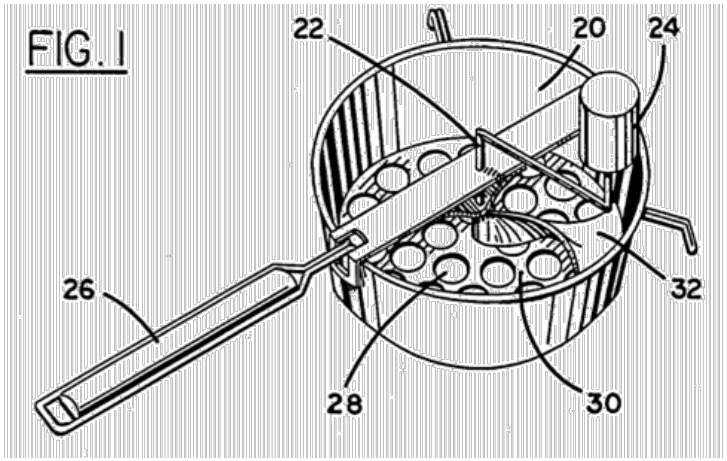
Patents

Extruders

- Cookie press
- Sausage press
  - In 1913
  - Public knowledge

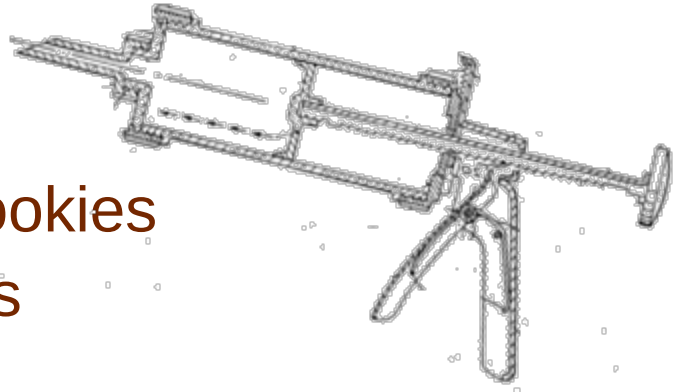






Possibilities

Hand-held Extruder



- Process
- Pros
  - Accurate placement cookies
  - Meet size requirements
- Cons
  - Repeated use may cause user pain
  - Excess time for refilling due to inability to dispense large amounts of dough
  - Completely disassembled for cleaning

Possibilities

Continuous Dough Log Cutter

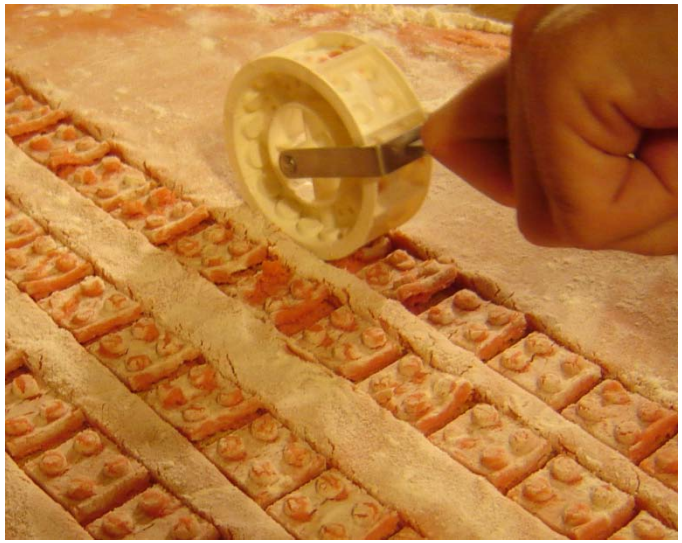
- Process
- Pros
  - High volume output of cookies
  - Mostly automotive processes
- Cons
  - Large Machine
  - Cumbersome
  - Many parts to clean

http://www.simmiecakes.com/wp-content/uploads/2009/08/dough_log.jpg

Possibilities

Rolling Cutter

- Process
- Pros
  - Large volumes of cookies
  - Sizes and shapes will be consistent
- Cons
  - Whole machine disassembled for cleaning
  - Large machine

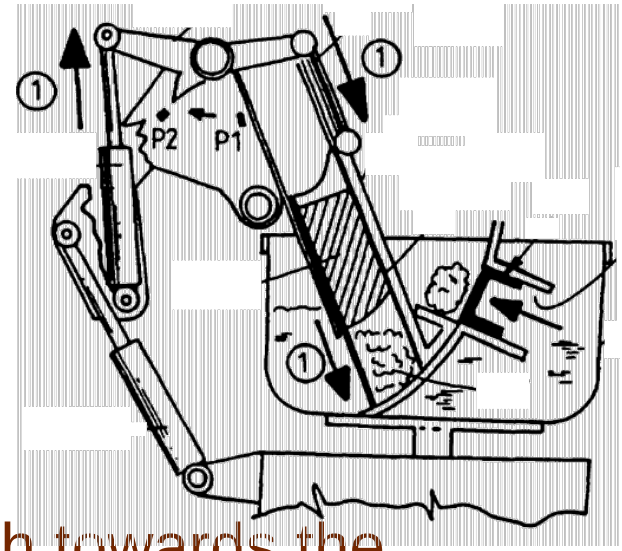


http://imjevin.wordpress.com/2009/09/13/peanut-butter-lego-cookies/

Possibilities

Scooper System

Patent 5895668



- Process
- Pros
  - Look interesting
  - Similar to current process
- Cons
  - Difficult to machine
  - Requires dough to be push towards the scoop
  - Laves an excess of dough

Possibilities

Side Pusher

- Process
- Pros
  - Use current bowl without modification
  - Automated
- Cons
  - Use a large amount of space
  - Large dents could cause the machine to jam
  - Difficult to machine

Possibilities

Flip Method

- Process
- Pros
  - 3 or 4 cookies produced simultaneously
  - Uses current bowl
- Cons
  - Leave a large amount of dough
  - Medium to large size machine
  - Much effort for user to flip the dough filled bowl over

http://www.webstaurantstore.com/stainless-steel-mixing-bowl-for-hobart-80-qt-mixer/915MXB80.html

Possibilities

Using Mixer

- Process
- Pros
  - Automatic dispensing of cookies
  - Only addition or modification to current equipment
- Cons
  - Bowl and paddle modifications
  - Difficult to manufacture
  - Mixer movement to complicated for adding attachment

http://www.vittitow.com/hobart-m-16.html

Possibilities

Sausage Press

- Process
- Pros
  - either electronic or manually operated
  - simple to use
  - simple to machine
  - few parts for assembly and disassembly
- Cons
  - moving dough to new bowl

Proposed Process

1. Mix Ingredients
2. Place in Extruder
3. Dispense Dough
4. Separate Dough
5. Place on Baking Sheet
6. Bake
7. Package

Proposed Budget

Item	Quantity	Cost/Item	Fall 09	Spring 10
Sausage Press	1	$200	$200	
Scooper	2	$15	$30	
Motor	2	$15		$30
Wire		$5	$5	
Plexi-Glass	3	$30		$90
Connection Hardware				$60
Bowl	1	$50		$50
Gears				$100
Electrical Hardware				$30
Stainless Steel	3	$5		$15
Miscellaneous				$35
		Costs	$235	$410
		Total Cost		$645

Perfect Mix reations

SOLUTIONS

For Promotional Materials

Proposed Media and Communications Plan

- Core campaign problem
- Existing elements

Campaign Elements

- Current website

Proposed Media and Communications Plan

- Core campaign problem
- Existing elements
- Proposed elements

Proposed Media and Communications Plan

Proposed Media and Communications Plan

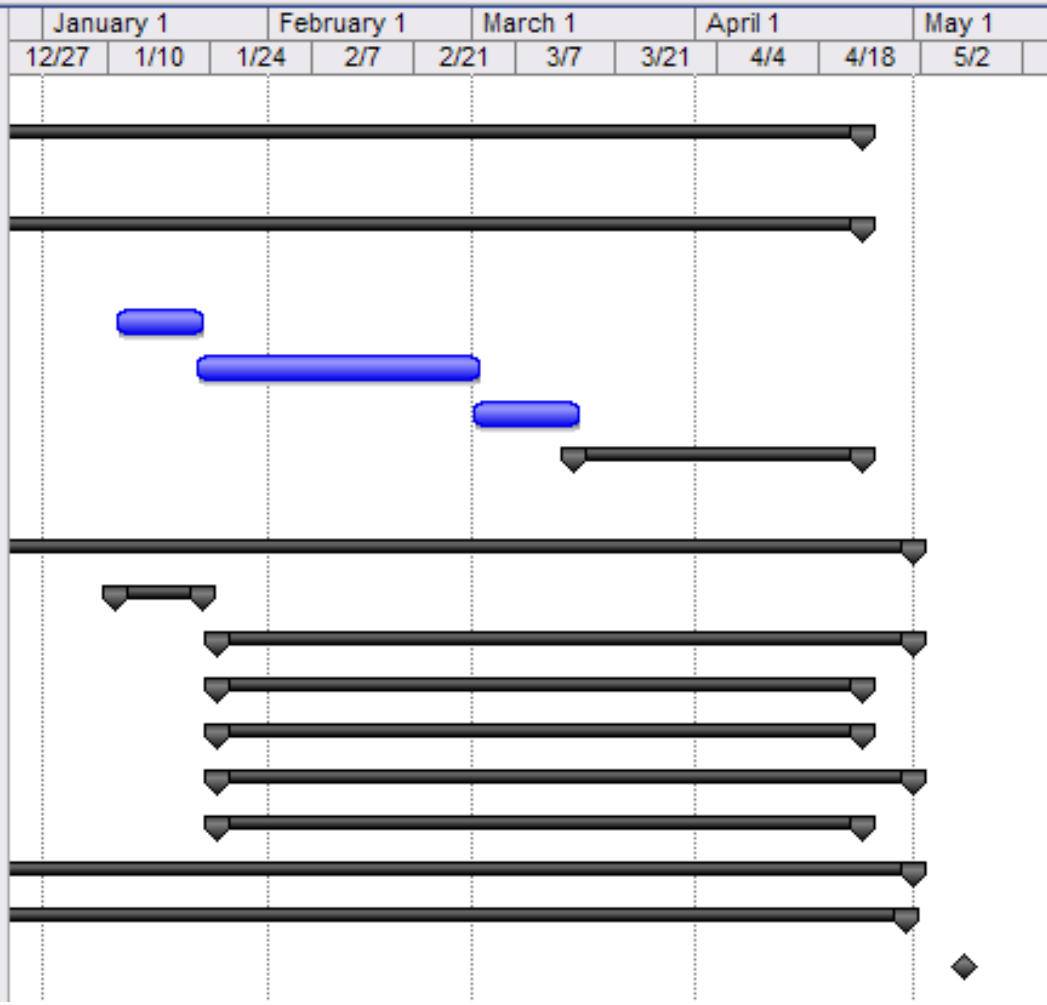
- Core campaign problem
- Existing elements
- Proposed elements
- Campaign element costs

Next Semester

- Business
  - Benefits of investment
- Prototype
  - Materials acquisition
  - creating large scale prototype
  - testing of large scale prototype
- Communications
  - campaign elements

Next Semester

Task Name
Project Start
Prototype
Concept
Design and Construction
Gather Raw Materials
CAD Drawings
Fabrication
Assembly
Testing
Costs
Campaign Elements
Concept
Design
Buisness Card
Brochure
Web site
Display Booth Sign
Production
Class Assignments
Project Finish



Conclusion

Thank you for your time ☺

Questions?

Comments?