Part 1. Cover Sheet with Elevator Pitch

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10
Water Basin and Filter to Transform an Artist's Dirty Paint Water into Usable Water for Painting
Physical/Engineering/Computer/Mathematics
STEM Business Plan

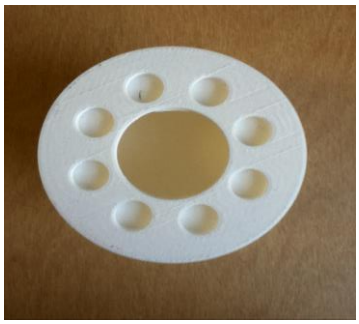
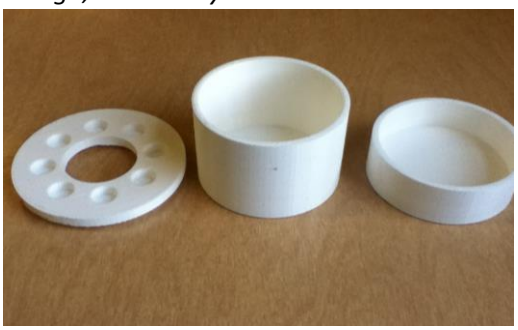
The hassle of using continuously dirty brush rinse water has been solved. *Painter's Pail* is an environmentally friendly, timesaving, artist's new pal to be sold at artist's supply stores to artists of all types. It is a water-based paint brush rinsing basin that filters and recycles used paint brush rinse water, removing the need to continually change the dirty water and eliminating paint contaminants from being included in the waste water.

Part 2. Executive Summary:

Painter's Pail is a rinse water vessel used by artists when changing colors on their brush. It includes a filtration system to clean the water, eliminating paint particles in the water. It will increase the productivity of the artist by eliminating the need to frequently change rinse water as well as eliminate the risk of cross contaminating colors on their work. This allows the artist to focus on their work without worry of the artwork being ruined due to contaminated water.

Painter's Pail consists of three main parts: a lid that will double as a non-stick coated paint tray, a quart size bottom heavy rinse water vessel, and submersible filter tray. The electric submersible pump will recirculate and clean the water, specially designed to filter and remove paint particles. As a result of research with artists, art teachers, and art students, the appropriate size and shape for the device has been determined, with future additional sizes and options available. The goal is to produce in volume for approximately 15 dollars per unit, at a wholesale cost of 22 dollars, and retail for 30 dollars. *Painter's Pail* is a viable product to be placed on the market as this type of product doesn't currently exist and would increase the productivity of any artist. Additionally, as this is a Green product as it promotes water conservation and the elimination of introducing chemicals into the municipal water supply. The product has been 3D printed as well as prototyped from off-the-shelf components for the purpose of testing and market research prior to initial volume production.

Images of 3D Printed model of design, created by author:


PRT 1 **PRT2** **PRT3**

Images of off-the-self prototyped design, created by author:



Before testing *(No paint added)*

During Testing *(Paint added)*

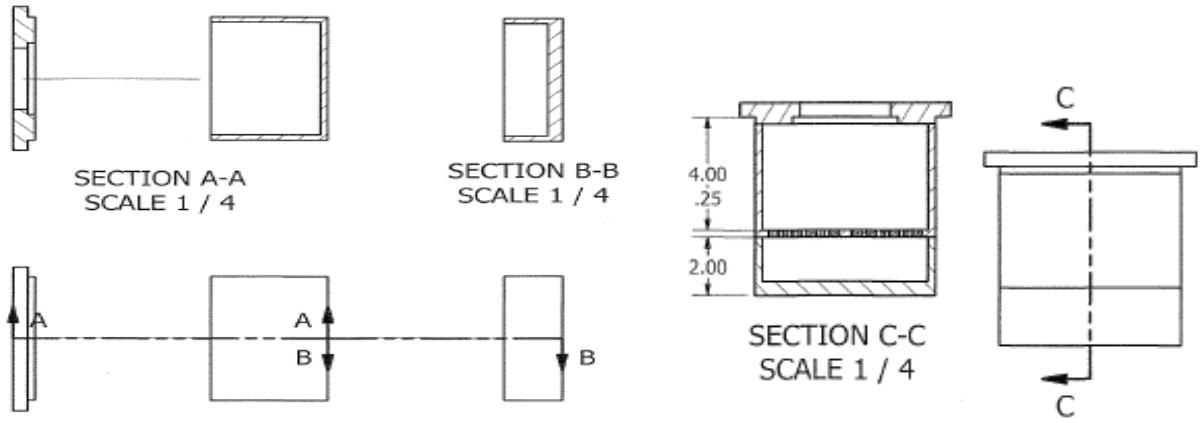
After Testing *(Paint removed by filter)*

Part 3. Problem Summary and Proposed Solution:

For most artists, a moment of creative inspiration is one that is like no other. There is nothing worse than to achieve this inspiration only to be interrupted by the constant need to swap out dirty brush rinse water in order to continue with creativity. Or perhaps one doesn't take the time to exchange the dirty rinse water and in their enthusiasm they end up painting a streak of dirty gray across the "White" House.

The solution to this is to make the exchange of dirty brush rinse water a non-issue by eliminating the manual operation of doing so and making it one that is performed continuously and automatically, without the distraction to the artist. This can be achieved by continually filtering the rinse water to remove the paint particles from the water and disposing of those particles in an environmentally friendly way. Additionally, the water container will have a lid to prevent spillage, hold brushes, and serve as a paint tray as well.

Autodesk sketches of design, drawn by author:



Part 4. Summarize the STEM Concepts and Principles Underlying the Overall Plan:

The four STEM Concepts and Principles utilized in this project will be Water Filtration, Electricity, Injection Molded Part Design, and Chemistry. Water filtration is already an idea used in many areas of everyday life but is being used uniquely in this situation as this type of product does not currently exist. Electricity will be involved as the filter pump will need to be powered in order to function and using electricity with water is a unique situation. Injection Molding will be utilized to design a unique vessel as it will need to not only house the water but a submersible filter pump as well. Chemistry will be used to determine how substances both attract to and repel each other to achieve the desired result.

Water Filtration is most often used to purify water so it is potable for human consumption. This scenario is unique in that an artist is concerned with removing harmful substances from the water before its return to the municipal water supply to lessen the amount of purification that must take place and automating an otherwise time consuming process, and eliminating a distraction during a moment of creativity. It will be necessary to determine how many parts per million of paint molecules will need to be removed as well as the rate of water exchange in gallons per minute in order to achieve clear water. The abbreviation for parts per million is 'ppm'. Ppm is used to measure the concentration of chemical in the water. So in this case ppm would give the average amount of paint (chemical) in the water so that a rate of how cloudy or clear the water is- could be calculated in milligrams. (C)=The concentration, msolute= solute mass. The equation is : $C(ppm) = 1000000 \times msolute / (msolution + msolute)$ (http://www.rapidtables.com/math/number/PPM.com)

Electricity is not something often used in conjunction with water-based applications, but in this situation, it is necessary to have a form of power to force the flow of water. If this were a situation where water flow could be applied, electricity would not be necessary. However, for this application, it would not be practical to plumb this product with a flow of water. The current design involves using a corded 120V AC electricity supply. Battery operated and or solar powered options will be explored to become an option around the 3rd year of the products lifetime, when it starts to become profitable. This is because it has been determined that the corded option is the best solution for the performance of this application as well as the ease of use to the end user. With common availability, the submersible pump will not be designed, but rather will be purchased as an off the shelf component. The filter and filtering materials will be designed to best meet the unique requirements of the application. As an electrical product, it would be necessary to have the product tested and certified to product safety standards by a Nationally Recognized Testing Laboratory in order to bear a certification mark such as UL, CSA, or ETL which indicates to retailers the compliance with safety standards and will meet their buying specifications. The testing Laboratory that has been chosen by the inventor is CSA because of their reliability and helpful resources. CSA's testing facilities were toured and helpful information about electricity and safety standards was gathered from staff. (http://www.alternative-energy-news.info/technology/solar-power/) (http://www.livescience.com/50657-how-batteries-work.html) (www.csagroup.org)

The next STEM concept is science. The coating covering the paint tray and basin is chemically formulated to not allow the paint to bond to the plastic surface of the container itself. This works by creating a protective layer on the plastic that paint cannot bond to because of chemical reaction that causes hydrocarbon chains (paint property) to not bond with molecules. This occurs for the same reasons oil repels water. This polycarbonate property is commonly used on buildings as a graffiti barrier (http://study.com/academy/lesson/what-is-hydrocarbon-definition-formula-compounds.html).

There will be Injection molding of three major components of this product: lid/paint tray, water vessel, and submersible pump tray. This is the most cost effective way to mass produce in terms of per unit cost and repeatability. Injection molders will require appropriate materials, part draft for mold ejection, wall thickness requirements, plastic flow into the mold, and cycle time of the parts. (https://www.stratasysdirect.com/resources/injection-molding/). Injection molding starts by feeding plastic for the part through a hopper into a heated barrel. The solid plastic pieces are then melted using heaters in the machine. The screw barrel adds heat that helps melt the plastic from friction. The now melted plastic is injected through a nozzle into one of the three specifically designed mold cavity. It then cools and hardens to the shape of the cavity, thus making the part needed (www.avplastics.co.uk).

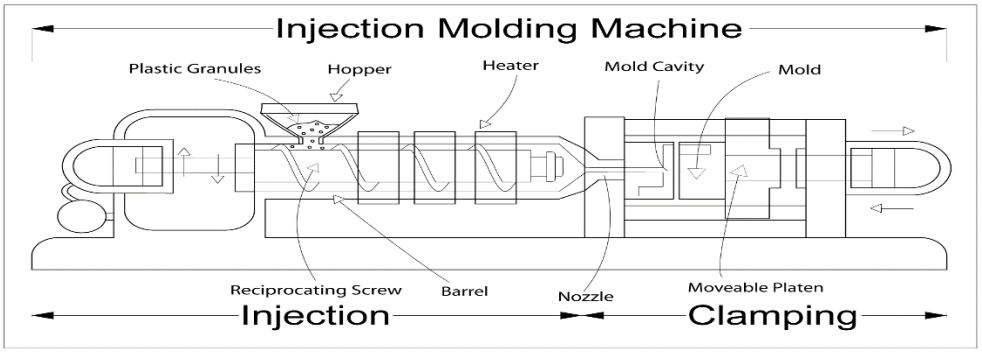
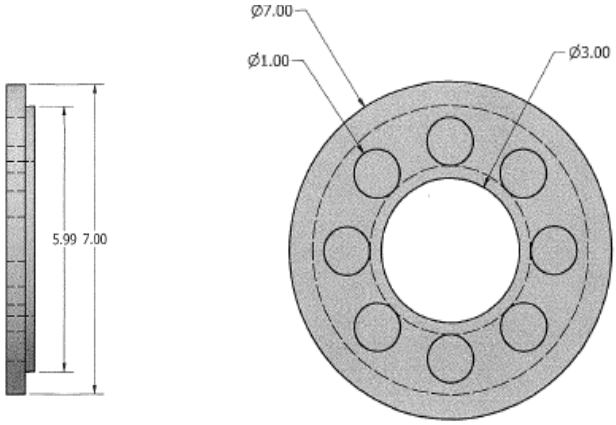


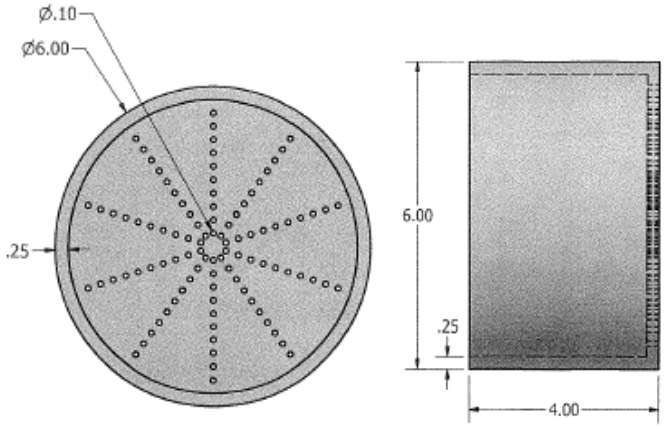
Image from www.avplastics.co.uk

Individual part Autodesk sketches, drawn by author:

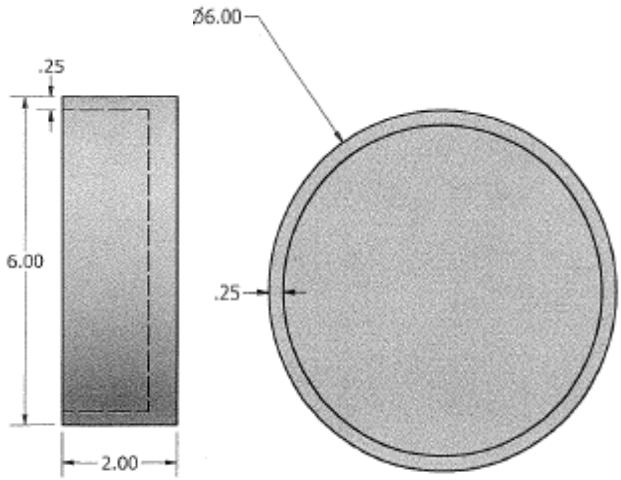
PRTS 1(lid/paint tray) ,2(water vessel), and 3(pump tray



Lid/Paint Tray: PRT 1



Water Vessel: PRT 2



Submersible pump Tray: PRT 3

Part 5. Commercialization Assessment of the Overall Plan:

Problem, pain point or market opportunity:

While painting, an artist encounters the hassle of paintbrush rinse water that quickly turns to a cloudy, opaque color. This can greatly affect the focus of an artist from their work because their mind is constantly having to worry about this so frequently. Even more frustrating is when one gets so wrapped up in the painting, their forgetfulness of not changing the water reflects on the now grayish black streak across the entire beautiful landscape they worked on for hours. Already in disappointment from a great piece ruined, one goes to clean the paint tray. However, the paint is stubborn to come off no matter how hard the artist scrubs, leaving unattractive and annoying paint stains all over expensive palettes that are meant to remain neutral for a reason.

Proposed solution:

The *Painter Pail* design economically solves these issues all in one. The injection molded plastic water vessel acts as another, however automatically keeping the consumers rinse water clean and clear. This way the artist can focus on what is truly important, their artwork and their livelihood. This is possible because of a specially designed filtration system inside the vessel that is constantly working with the artist to keep the water as clear as possible throughout the duration of the painting. The water vessel and lid that doubles as a paint tray will be given permanent coatings.

Target customers and intended users:

The target end customers and intended users would be artists, art teachers, and art students who regularly experience the frequent necessity to change dirty rinse water in order to continue to be productive. Initially it would be marketed online through its own website with anticipated expansion to major online retailers such as Amazon, QVC, as well as art and school supply websites. With a strong internet presence, it could then be expanded to the shelves of discount retailers such as Walmart and Target and craft chain stores such as Joann Fabrics, Hobby Lobby, and Michaels.

Competitors:

Research shows there are no similar products currently available on the market. The only competition would be for someone who chooses to continue to manually change their rinse water in lieu of adopting the new technology where it can be done automatically. When U.S. patents were preliminarily researched (*www.uspto.gov)* under the terms “water vessel with filter”, "paint rinse water filter", "artist water filter", and "water based paint filter" and no results were found for any of these terms. A more complete patent search would need to be conducted but this preliminary research shows no competitors.

Customer value proposition & competitive advantage:

The value to the user is in the elimination of a monotonous task that when ignored or delayed lessens the quality of their work. Additionally, it provides a more environmental solution to the disposal of waste water containing contaminants by removing them prior to necessary treatment. With no real competitors there is no direct comparison to similar products. It can only be compared to the lack of an automated process that requires the user to do this task manually.

Principal revenue streams expected:

Bill of Materials				
Per unit Materials	$11	Wholesale cost	$22	$7 profit for 32% profit
Per unit Assembly	$ 3	Retail cost	$30	$15 profit for 50% profit
Per unit packaging	$ 1			
Per unit cost	$15			

Principal startup and operating costs expected to be incurred:

Capital Startup Product Specific Expenses:		Working Capital General Expenses:	
Injection mold for main water vessel	$40,000	Operating Cash	$ 5,000
Injection mold for pump tray	$10,000	Inventory	$10,000
Injection mold for lid/paint tray	$ 8,000	Office Equipment	$ 2,000
Filter & mold material prototyping	$ 8,000	Manufacturing Equip	$ 5,000
Legal & Patent expense	$15,000	Building Improvement	$ 4,000
Product certification	$ 5,000		
Website and e-commerce set up	$ 6,000		
Total	$92,000	Total	$ 26,000

Based on the attached Financial Projections, this product would not be profitable until the 4th quarter of the first year and making the first year a loss of approximately $8,000. The second year would be break even while the third year would show a profit of $24,000. The Financial Projection numbers are based on an initial offering thru online sales and website only, resulting in the retail price of $30 being realized but at lower volumes. It would be expected that at some point during the third year the product would be picked up by major retailers significantly increasing the volume while reducing the realized sales to the wholesale cost of $22. It would be expected that school sales would be strongest in the third quarter of each year while other sales would be spread across the year.

The goal is to outsource the assembly of the purchased raw materials to operate a manufacturing facility. A partnership with a public service organization for disabled students and adults that could train individuals to complete the simple assembly process would be desired. As a public service, this would provide jobs and income to an underserved part of the community. It would still be necessary to maintain a warehouse for raw inventory, finished goods inventory, and a shipping facility.

Part 6. Business and Financial Proof of Concept:

Marketing, sales and pricing strategies to bring your product or service to market:

Live demonstrations will be given at schools, tradeshows, art fairs, and teach supply stores. Initially, the emphasis will be to start locally and expand regionally. In order to establish a a reputation, it can be shown in surrounding counties at local events such as the Ashland, Knox, Holmes, Wayne, and Richland County Fairs as well as to the elementary, middle school, high school, and general art teachers in those same counties.

This markets to young, up-and-coming artists to use in the future and promote themselves as well as teachers. Internet art supply companies will be worked with an expectation of a major contribution to sales. Initial estimates are 80% of sales will be via the internet, through the company's website or a partners. It will be necessary to send a limited quantity of free samples to key individuals who will be buying for large art schools or large chain craft stores. It is important to appeal to these consumers in being very flexible and reasonable with pricing when sold in mass quantities, offering program to schools. For example, if they buy 10, they would get 2 free.

Estimated raw material costs are $11, assembly labor of those parts $3, and packaging $1, creating a total per unit cost of $15. Therefore, with a wholesale cost of $22 per unit, this would result in a $7 per unit profit and a 32% profit margin. The retail cost (directly purchased from the website) would be $30, creating a $15 profit, a 100% markup, and a 50% profit margin.

Operational plans for developing and making product into a tangible commercial venture:

2 weeks	Make a rough prototype from existing parts
4 weeks	Design product on 3D software and have 3D parts printed
2 weeks	Do a Proof of Concept on 3D parts
4 weeks	Have a prototype mold made to manufacture prototype parts for marketing distribution
3 weeks	Source a pump manufacturer to purchase pump from
5 weeks	Research filter materials and effectiveness
1 week	Visit Injection molders to determine mold and part costs
12 weeks	Submit for patent
1 week	Speak to certification body on required testing and samples needed for certification
2 weeks	Resource options for assembly and packaging labor costs
4 weeks	Submit prototypes to Buyers at online and physical store retailers for consideration in their product line
12 weeks	Order injection molds for production parts
4 weeks	Complete initial product runs and assemblies
4 weeks	Submit for certification

Some of these tasks can be completed concurrently so a more detailed analysis would need to be done to calculate total time to market.

Material and labor costs needed to make, develop, and distribute product:

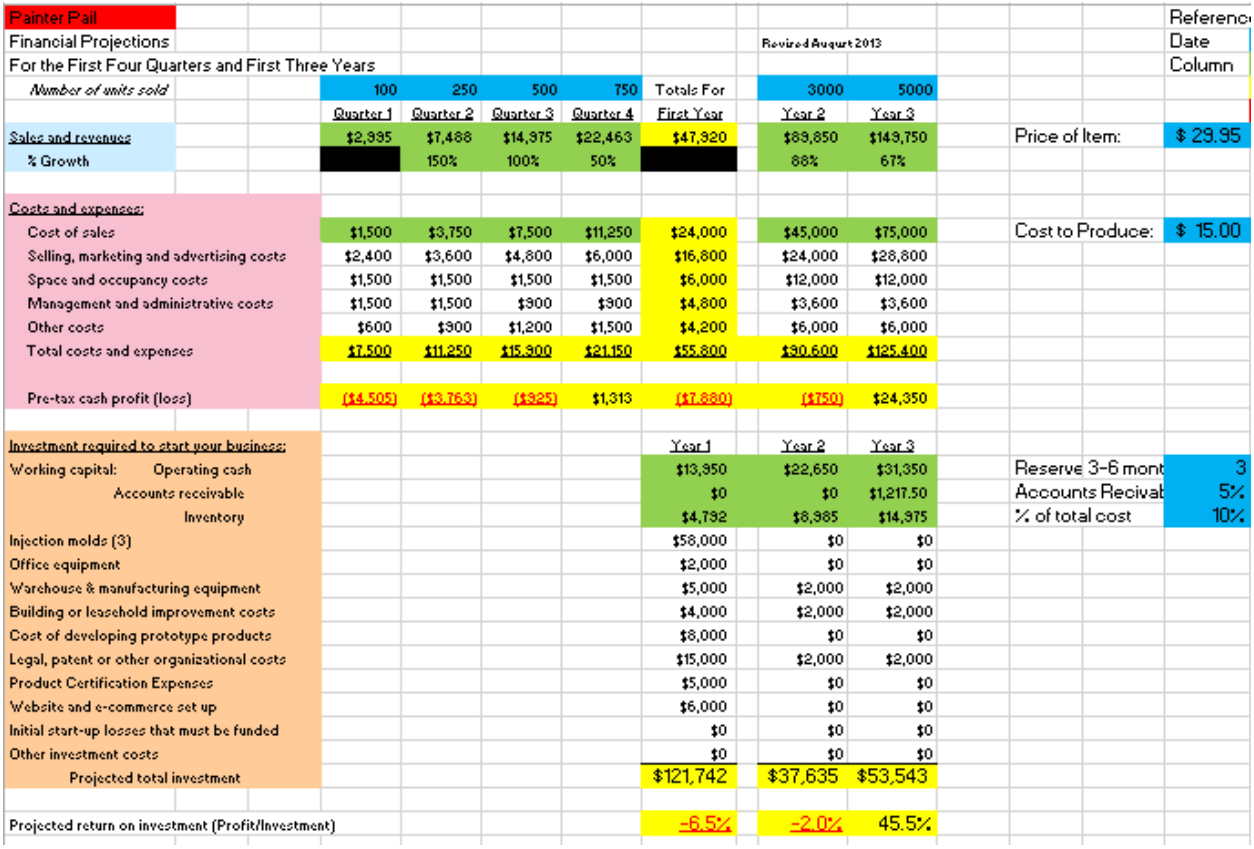
Injection molded lid/paint tray	$0.75	
Injection molded body	$2.40	
Injection molded pump tray	$1.10	
Pump from manufacturer	$5.00	
Filter materials	$2.25	
	$11.00	
Assembly Labor	$3.00	(Low skills required, outsource to disabled demographics)
Box	$0.70	
Label	$0.25	
Instructions	$0.05	
	$1.00	

Significant risks and uncertainties expected in bringing venture to market:

There is uncertainty in how the consumer will perceive the device as it currently exists nowhere else on the market leaving no statistics to analyze. Therefore, this could incur additional expense but the risk, is worth it as its opportunity for an untapped market is greater. This means if *Artist Filtered Rinse Water Vessel* were to take off, it would have no initial competition. It can be delivered at a high quality at a very reasonable cost. Materials and low skill labor are both readily available. This remains possible as the sources and suppliers are reliable. Investment capital and loans will be required for my invention. The investor would take a share of my company in return for the investment. Government regulations

will be always met and managed, via submission for product certification thru a Nationally Recognized Testing Laboratory, making the device in compliance with regulations.

The following is a screenshot of the financial projections spreadsheet:



Painter Pail									Referenc
Financial Projections						Revised August 2013			Date
For the First Four Quarters and First Three Years									Column
Number of units sold	100	250	500	750	Totals For	3000	5000		
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	First Year	Year 2	Year 3		
Sales and revenues	$2,395	$7,488	$14,975	$22,463	$47,320	$89,850	$149,750	Price of Item:	$ 29.95
% Growth		150%	100%	50%		88%	67%		
Costs and expenses:									
Cost of sales	$1,500	$3,750	$7,500	$11,250	$24,000	$45,000	$75,000	Cost to Produce:	$ 15.00
Selling, marketing and advertising costs	$2,400	$3,600	$4,800	$6,000	$16,800	$24,000	$28,800		
Space and occupancy costs	$1,500	$1,500	$1,500	$1,500	$6,000	$12,000	$12,000		
Management and administrative costs	$1,500	$1,500	$900	$900	$4,800	$3,600	$3,600		
Other costs	$600	$900	$1,200	$1,500	$4,200	$6,000	$6,000		
Total costs and expenses	$7,500	$11,250	$15,900	$21,150	$55,800	$90,600	$125,400		
Pre-tax cash profit (loss)	($4,505)	($3,763)	($925)	$1,313	($7,880)	($750)	$24,350		
Investment required to start your business:					Year 1	Year 2	Year 3		
Working capital: Operating cash					$13,350	$22,650	$31,350	Reserve 3-6 mont	3
Accounts receivable					$0	$0	$1,217.50	Accounts Recival	5%
Inventory					$4,792	$8,985	$14,975	% of total cost	10%
Injection molds (3)					$58,000	$0	$0		
Office equipment					$2,000	$0	$0		
Warehouse & manufacturing equipment					$5,000	$2,000	$2,000		
Building or leasehold improvement costs					$4,000	$2,000	$2,000		
Cost of developing prototype products					$8,000	$0	$0		
Legal, patent or other organizational costs					$15,000	$2,000	$2,000		
Product Certification Expenses					$5,000	$0	$0		
Website and e-commerce set up					$6,000	$0	$0		
Initial start-up losses that must be funded					$0	$0	$0		
Other investment costs					$0	$0	$0		
Projected total investment					$121,742	$37,635	$53,543		
Projected return on investment (Profit/Investment)					-6.5%	-2.0%	45.5%		

Part 7. Acknowledgements:

Lisa Reiheld, the author's mother, Mechanical Engineer, provided engineering knowledge, helped edit this document, and purchased materials for prototype.

CSA Group, a third party safety certification organization permitted the author to tour its facility and speak with experienced staff to gather statistical information as well as get a realistic grasp on what it takes to fully invent my product and the importance of designing it to safety standards so that it can be sold safely and most effectively.

Mr. Ron Lance, Loudonville High School and STEM Drafting Teacher, who permitted the author's use of the school 3D software and use of the 3D printer to produce a scaled version.

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