Green Clean – Final Summary Report

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Abstract

This report details the process of creating and developing our product known as Green Clean, a bar soap shaving dispenser. By utilizing the design process and making decisions influenced by market research and potential customer interviews, we have developed a product that we believe will help change the usage of bar soaps for a greener future. From the initial idea generation, this paper documents the journey we took in developing this product, including the market research, problem statement generation, customer survey, product needs, solution generation, patent research, idea categorization through Pugh analysis decision matrix, product development, FEA validation, customer market evaluation, financial analysis, value proposition, next steps, and design tool utilization. The paper concludes that our product would be viable on the market today as most companies are switching from a shareholder to a stakeholder business model. This compounded with an estimated cost reduction of 29% and waste reduction of 82% annually in the hotel industry would entice companies to purchase and use our product. The individual consumer is also more environmentally conscience today and therefore will be more inclined to purchase our product.

I. Market Research and Problem Statement

Looking at the world today, one problem that was apparent to our group was the excessive wastage of single use soap bars in the travel industry. To validate our initial problem conception, we conducted market research. While performing the research, we found substantial data on Marriott and therefore decided to use Marriott as a case study for the hotel industry, and the travel industry as a whole. We also limited our research to the US to have more relatable figures.

According to the AHLA, there are roughly 54200 Hotels in the US, comprising 5.5 million occupancy rooms [1]. Marriott specifically has 5384 hotels in the US [2]. This equates to Marriott being roughly 10% of the hotel industry in the US. Looking at data from Forbes, we found that Marriott spends roughly $20 million on single use toiletries [3]. If we consider disposable soap bars to take up 15% of that cost, we calculated that single use soap bars cost Marriot $3 million. According to the Telegraph, roughly 2 million soap bars are disposed of daily in the US [4], or 730 million soap bars annually. Doing the math, we found that 73 million soap bars are costing Marriott $3 million annually. During the research we also found that there is a company that is recycling these wasted soap bars. The company Clean the World was founded in 2009 and had recycled 40 million soap bars till the publication of the article in the Telegraph in 2017 [4]. This might seem like a large number at first glance, but at scale, this amounts to a less than 1% recycle rate of disposed

soap bars as 5.84 billion soap bars were disposed of in those 8 years. We also found that Clean the World charges hotels $0.75 per room per month for their services [5], thereby increasing the total cost hotels bear for their single use soap bars. Taking all these factors into consideration, we concluded that our problem is valid and came up with our problem statement: *On an annual basis, the hotel industry disposes of roughly 730 million soap bars, costing them $20 million. Only 1% of those soap bars ever get recycled, leading to a gross wastage of product that leaves a detrimental impact on the environment.*

II. Customer Survey and Needs

In the process of coming up with a solution to our problem statement, we conducted a customer survey of more than 60 individuals to identify the needs of our product. Based on our survey, we were able to identify the main problem associated with soap bar usage and address it as part of the core needs of our product. We categorized our core needs into 5 categories: convenience, long term usage, price, environmental friendliness, and safety. After our interviews with potential consumers, we learned that a huge problem people have with bar soaps is their tendency to feel slimy after continual use. They view soap bars as unsanitary as they feel that the soap bar's surface is never properly clean due to many people using the same bar of soap. This causes most customers to want to use liquid soap, despite their inherent negative environmental impact. This negative environmental impact stems from the liquid soap being transported and stored in plastic bags, something that is unnecessary for bar soaps. Our products core needs are shown in Table 1.

Table 1: Needs Categorization and Ranking

Needs	Description
Convenience	The product must dispense enough soap to properly wash one's hands
Long Term Usage	The mechanisms of the product must be protected from rusting and malfunctions; the product must be able to have a long usage life
Price	The product's price should be comparable to the cost of other soap dispensers on the market currently
Environmental Friendliness	The product should reduce the usage of single use plastics and utilize more biodegradable products
Safety	The product should have no sharp edges and reduce the chance of injury

III. Solution

To address the problem statement and the customer needs, our team came up with a novel solution to increase the usage of bar soaps. Our solution was to create a product that would dispense soap bar shavings. This product would be able to load up soap bars of varying shapes and sizes and dispense an appropriate amount of soap shavings to facilitate proper hand

washing. This would eliminate the environmental and economic waste caused by trashed soap bars and also provide a decent and viable alternative to liquid soap, helping combat the plastic waste associated with these kinds of single-use soap products. By providing soap bar shavings we are also improving on the negative connotations and unsanitary concerns with soap bars by eliminating the need for consumers to make direct contact with the bar anymore. Without physical contact, soap bars can now be used till completion and remain untouched, clean, and not slimy.

IV. Patent Survey

To find how saturated the current market was and the existing patents relating to our product, we conducted an initial patent search. We clustered our patents using three criteria: user interface, system, and shapes & sizes. According to our categorization, we were able to shortlist the top 3 patents from which we took inspiration. The main ideas we employed in our product from the patent search were push mechanism, grinding, manual system, and rectangular shape. All the shortlisted patents were filed in the 1930s and are expired. The top 3 patents were as follows:

1. **US2108092A** [6] *{Grind, Automatic, Cylindrical}*
    a. This contains most of all the elements of our top concept chosen through Pugh analysis such as a spring-loaded mechanism, blades to grind the soap, is wall-mountable, and features a push/press mechanism for the user. It is marketable to any individual or corporate entities that use bar soaps or have a soap dispenser in their bathrooms. We hope to aim for a seamless, clean, and refreshing experience that makes users excited to wash their hands with our product. The actual components are easy to manufacture as well.
2. **US2029701A** [7] *{Twist, Manual, Portable}*
    a. This includes the grinding mechanism that successfully grinds/shaves the bar soap. In terms of its practicality, it is easy to carry out as there are no sophisticated mechanisms--only the grinding handle and pulverizer (maintaining pressure of soap). The dispenser may output satisfactory operation efficiently and economically when delivering a constant amount of soap per rotation of the grinding handle. Both the approachable and aesthetic aspect may be marketable.
3. **US2489081A** [8] *{Push, Manual, Rectangular}*
    a. This includes the grind wheel that makes it extremely easy for a user to use. Whether you are in a hurry or not the soap will be easily accessible for all. The design is not too complicated as it was built around 70 years ago. The inside blade uses a simple rotating wheel that shaves the soap. It is spring loaded so it will keep the soap piece inside. The spring-loaded mechanism is something we may be able to apply to our current design.

V. Idea Categorization

Using our researched patents, we came up with 60 initial product designs. To combine these designs, we clustered our ideas using 4 categories: actuation, shape, feature, and attachment. Based on these categories, we were able to narrow down our 60 initial product designs to 17 unique ones. From here, to find our top 5 designs, we utilized a Pugh analysis (Appendix A). We weighted our initial 4 categories and their respective subcategories but also added some important external factors such as complexity, hygiene, and reliability. Using this decision matrix, we were able to narrow down our 17 unique project concepts to the top 5 project concepts, with out top project concept featuring a push mechanism, rectangular shape, windows, and wall mount.

VI. Design Progression

Our product design went through numerous iterations, starting from simple sketches and culminating in 3D CAD models.

1. Initial Design

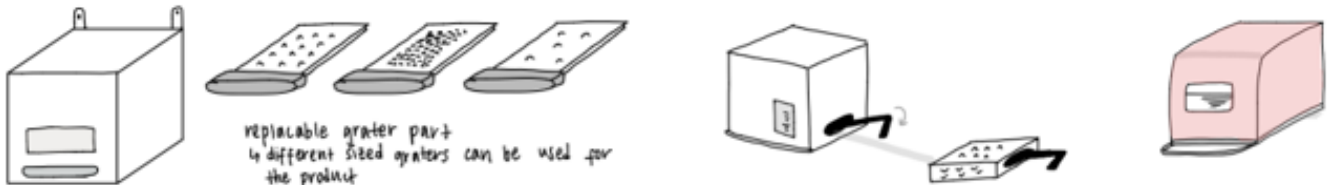

Figure 1: Initial Product Designs

2. Intermediary Designs

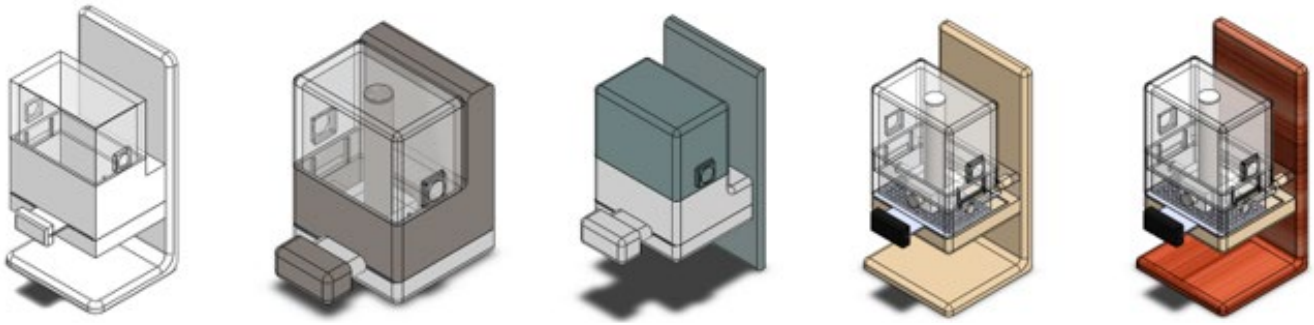

Figure 2: Intermediary Product Designs

3. Final Product Design

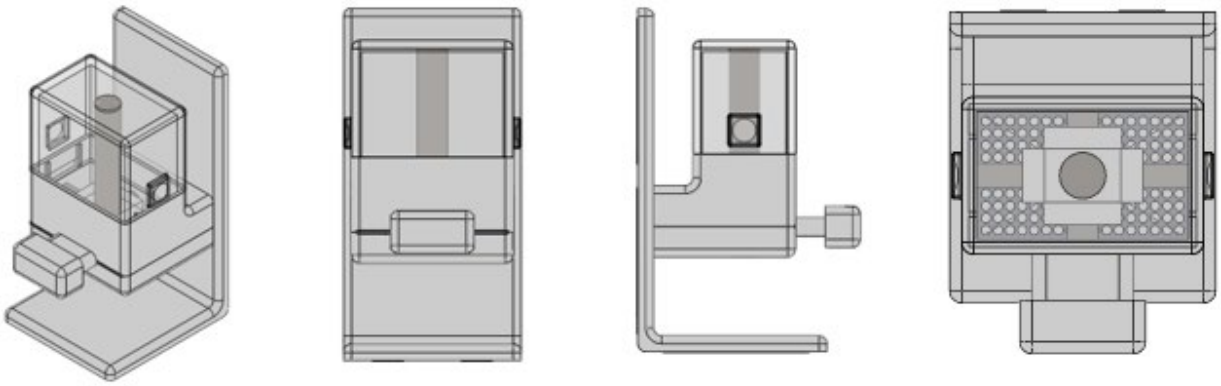

Figure 3: Final Product Design (from Left to Right: Isometric View, Front View, Side View, Top View)

VII. Final Product Rendering

Figure 4: Final Product Rendering (from left to Right: Isometric View, Front View, Side View)

VIII. Product Specification, Materials and Features

Along with the prototype, we are planning to offer two commercial models: A Luxury Model and a Standard Model.

Common specifications and features between the Prototype, the Luxury Model, and the Standard Model:

- *Dimensions:* 8.54" H x 4.33" W x 4.72" D
- *Capacity:* 1 soap bar (2 oz – 6 oz), any shape
- *Spring:* Stainless Steel (Century Spring Corp.)
- *Grater:* Stainless Steel (die casted and machined)
- *Power Source:* Manual (hand push)
- *Mechanism:* Spring loaded clamp and grater
- *Feature:* No sharp edges to reduce chance of injury
- *Feature:* Easy press release to replace soap bar

Unique specifications and features of the Prototype:

- *Weight:* 2.64 lbs. without soap bar
- *Body:* ABS-M30 (3D printed on Stratasys at Jacobs)
- *Attachment:* Command Strips (3M)

Unique specifications and features of the Luxury Model:

- *Weight:* 5 lbs. without soap bar
- *Body:* Stainless Steel 304 (die casted and machined)
- *Attachment:* Screws (Bolt Depot)
- *Feature:* Varied colors and finishes
- *Feature:* Personalization with engraved client logo
- *Feature:* Modular build for component replacement

Unique specifications and features of the Standard Model:

- *Weight:* 2.64 lbs. without soap bar
- *Body:* ABS-M30 (injection molded)
- *Attachment:* Command Strips (3M)
- *Feature:* Varied colors and finishes

IX. FEA Validation

We ran FEA on our product for 2 load case scenarios. This was done to validate our design choices and ensure the structural integrity of our product during continuous usage. The FEA set up included a moderate curvature-based mesh that ensured at least 2-3 elements across the thinnest dimension on every part, the expected load case in the direction of

the load, fixtures that kept the product in place, and contact sets that established the connection between each part. In terms of results, we checked the Von Mises stress distribution and compared it to the weakest materials yield strength to ensure that no part would yield and exceed that minimum yield stress value. We also checked displacement to ensure that when these load cases were applied, the displacement would not exceed an uncomfortable value.

1. This load case simulated the user pushing on the push button to actuate the grater to get soap shavings. We estimated a force of 50 N, which resulted in a maximum stress of 0.53 ksi and a maximum deflection of 0.000341 in as shown in Figure 5. This results in a safety factor of 5 and extremely negligible displacement in the material.

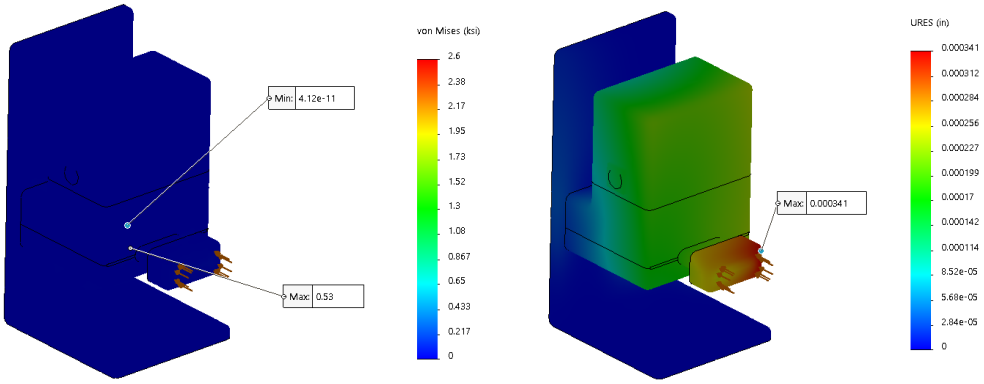

Figure 5: FEA Analysis of 50N Push Force (from Left to Right: Stress Analysis, Displacement Analysis)

2. This load case tested the maximum force exerted on the upper compartment due to the maximum compression of the spring originating from a soap bar being in the product. The force applied was 11 N as taken from the load rating of the spring. This resulted in a maximum stress of 0.536 ksi and a maximum deflection of 0.00116 in as shown in Figure 6. This results in a safety factor of 5 and extremely negligible displacement in the material.

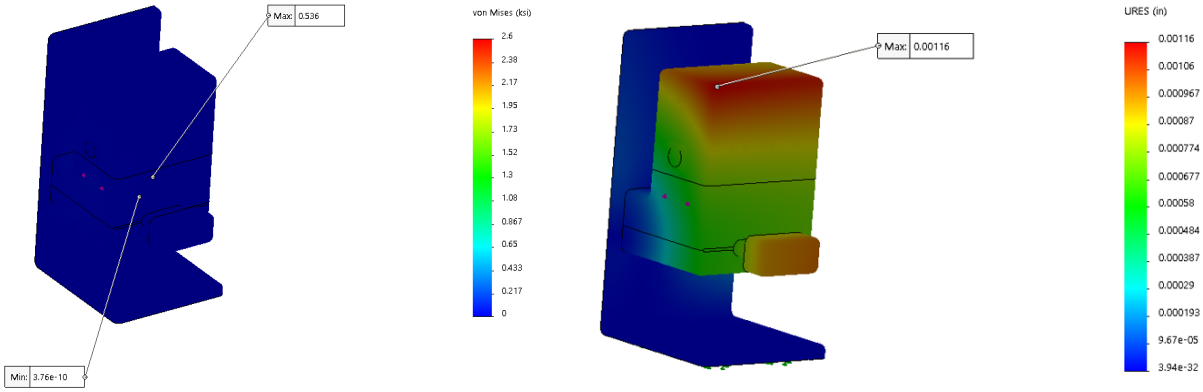

Figure 6: FEA Analysis of 11N Spring Compression Force (from Left to Right: Stress Analysis, Displacement Analysis)

X. Target Customers, Market Segment and Marketing Strategy (Calculations in Appendix A)

Although this might seem like a niche product, during our business canvas research, we identified 2 potential market segments based on 2 criteria: level of need and level of enthusiasm. Based on our criteria we identified the most dominant of our market segments – the travel industry. Here we estimated a 10% potential market reach which led to a market evaluation of roughly $44 million. This market segment comprises of 3 different customer groups: hotel industry, cruise

industry, and national parks. Data for the cruise industry [9] and National Parks [10] was sourced from Statista and the NPF, respectively. Our second market segment based on our criteria was the individual consumer. Here we estimated a 1% potential market reach which led to a market evaluation of roughly $38 million. This market segments comprises of 2 different customer groups: individual household consumers and college campuses. Data for individual household was sourced from Statista [11]. We defined "level of enthusiasm" as the likelihood of consumers adopting our product. With younger generations and ecologists being on average more environmentally conscious [12], we wanted to specifically target groups (colleges and national parks) that would be receptive to our more environment friendly product. With "level of need" we wanted to specifically target groups (hotels and cruises) that would benefit economically from our product. Our marketing strategy is twofold. With larger entities like hotel chains, cruise lines, national parks, and college campuses we would assign liaisons to talk directly with company representatives about the benefits of our product, any specific needs, and why they should adopt them in all their suites. This would also set up a good communication model between our company and clients. With individual consumers we would market solely on the environmental aspect of our product, focusing on green certifications from environmental agencies (EPA) and potential company environmental activism. We intend to sell through online retailers such as Amazon and department stores such as Bed Bath and Beyond and Target.

XI. Financial Analysis and Value Proposition (Calculations in Appendix A)

To validate our market segments and establish value propositions, we conducted financial analysis. Using Marriott as a case study for the hotel industry and the travel industry, we estimated a cost reduction of 29% and waste reduction of 82% annually from adopting our product. This, along with a 2019 article from CNN documenting Marriott's pledge to reduce its usage of single use toiletries [13], further cements our product as a viable option for the hotel industry. As mentioned earlier in the paper, hotels, and other lodging industries such as cruise lines and resorts have a soap usage model that carries large environmental and economic pitfalls that our product was designed to combat. For the individual consumer, they would be enticed to purchase our product due to its environmental benefits. Our product has a low carbon footprint and does not use single use plastic. Bar soaps are also more biodegradable as they have fewer chemicals than liquid soap. To verify the commercialization of our scaled-up models, we conducted financial analysis on our costing and selling price point. Accounting for a 25% of revenue SGA [14], we calculated a minimum net profit margin of 27% for the Luxury Model and 20% for the Standard Model. We used an online calculator [15, 16] as the basis of the COGS of our products.

XII. Next Steps

There are more steps that we need to take to commercialize our product. The most important of those steps is building the

prototype and acquiring funding through investors. We would also have to set up an office, shortlist and negotiate contracts with vendors for components, manufacturing, and services, establish our distribution network through retail, hotel liaisons, and cruise line liaisons, and establish a customer care center. We would also need to file a patent for our product and start to engage in environmental advocacy.

XIII. Design Tools

We have used numerous design tools in this project. We have used design thinking throughout the designing of this product. We conducted a customer survey and distilled those responses to get our customer needs. We employed the Triple Bottom Line Principle in our product where we not only consider our profit margin but also focus on the social and environmental ramification for our product. Our company is more geared towards a stakeholder business modal rather than a shareholder business model. We utilized concept screening and analysis principles such as a Pugh analysis decision matrix to narrow down and chose our top concept. We also utilized design architecture and planning in coming up with our final product. Our product is predominantly modular in nature and our design progression goes from the basic shape of the product to later us adding in the details and fleshing out the functionality of it. We also prototyped our product in CAD and conducted risk analysis on our product with a FEA validation. Along with that, our product utilized DfM and DfE in its design. All the components can be mass produced through injection molding or die casting and the product has a low carbon footprint. Some of the economic design tools we utilized include business model canvas to identify our target customers and market segment and value proposition to show why our product would be valid on the market today. We also used Gross and Net Profit Margins to validate the selling price of our product.

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Appendix A – Calculations and Analysis

1. Idea Categorization

Concept #	Criteria (Actuation, Shape, Feature, Attachment)	Individual Idea #
1	[Sensor] [Rectangular] [Windows] [Wall-Mount]	EC4, EC8, EC9, EC10, RR1, RR7, OU3, OU4, SMK6, SMK9
2	[Sensor] [Rectangular] [Windows] [Table-Mount]	EC5
3	[Hand-Crank] [Rectangular] [Windows] [Wall-Mount]	EC2, RR2, RR8, OU8
4	[Hand-Crank] [Rectangular] [Windows] [Table-Mount]	EC3, OU1, OU2
5	[Push] [Rectangular] [Windows] [Wall-Mount]	EC1, EC6, EC7, SMK1, SMK2
6	[Sensor] [Rectangular] [Windowless] [Wall-Mount]	RR3, JB9, HC4, HC7, HC8
7	[Push] [Rectangular] [Windowless] [Wall-Mount]	JB1, JB4, JB5, JB6, JB7, JB8, HC1, HC3, HC5, HC9, OU5, OU6, SMK7, SMK8
8	[Hand-Crank] [Rectangular] [Windowless] [Wall-Mount]	RR4, JB2, HC2, HC6, OU9
9	[Push] [Rectangular] [Windowless] [Table-Mount]	JB3
10	[Push] [Rectangular] [Transparent] [Wall-Mount]	JB10, OU7
11	[Sensor] [Rectangular] [Transparent] [Wall-Mount]	RR5
12	[Hand-Crank] [Rectangular] [Transparent] [Wall-Mount]	RR6, SMK4
13	[Sensor] [Circle] [Transparent] [Wall Mount]	RR9
14	[Hand-Crank] [Circle] [Transparent] [Wall Mount]	RR10
15	[Push] [Rectangular] [Personalization] [Wall-Mount]	HC10, OU10
16	[Prism Grater Crank] [Rectangular] [Table Mount]	SMK3
17	[Cylindrical Grater Crank] [Rectangular] [Table Mount]	SMK5, SMK10

2. Pugh Analysis Decision Matrix

			Concept																
	Base	Weight	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Category																			
Aesthetic																			
- Personalization	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
- Shape	0	3	1	1	1	1	1	1	1	1	1	1	1	1	-1	-1	1	1	1
- Windows	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
- Transparent	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0
Mechanism																			
- Push	0	3	0	0	0	0	1	0	1	0	1	1	0	0	0	0	1	0	0
- Crank	0	2	0	0	1	1	0	0	0	1	0	0	0	1	0	1	0	1	1
- Sensor	0	1	1	1	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0
Mounting	0	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0
Complexity	0	3	-1	-1	0	0	1	-1	1	0	1	1	-1	0	-1	0	1	0	0
Reliability	0	2	-1	-1	0	0	1	-1	1	0	1	1	-1	0	-1	0	1	0	0
Hygiene	0	3	1	1	-1	-1	0	1	0	-1	0	0	1	-1	1	-1	0	-1	-1
Total +			10	9	8	7	14	8	12	6	11	13	9	7	6	4	13	5	5
Total -			-5	-5	-3	-3	0	-5	0	-3	0	0	-5	-3	-8	-6	0	-3	-3
Total			5	4	5	4	**14**	3	**12**	3	**11**	**13**	4	4	-2	-2	**13**	2	2

3. Market Segment Evaluation

	Total Market	Market Reach	Sale Price	Potential Market Value
Travel Industry				**$ 44,434,089**
Hotel Rooms	5,500,000	10%	$ 39.99	$ 21,994,500
Cruise Cabins	5,527,500	10%	$ 39.99	$ 22,104,473
National Park Restrooms	83,800	10%	$ 39.99	$ 335,116
Home Use				**$ 38,387,200**
Households	128,000,000	1%	$ 29.99	$ 38,387,200
Total				**$ 82,821,289**

4. Value Proposition – Hotels

	Total	Marriott*
Number of Hotel Rooms in US	5,500,000	
Percentage of Hotels operated in US		10%
Number of Hotel Rooms		550,000
Total Cost on Toiletries		$ 20,000,000
Share of Bar Soap within Toiletries		15.0%
Expenditure on Bar Soaps		$ 3,000,000

	Single Use Bars (Current)	With Soap Bar Dispenser	Savings
Capital Cost / Room	$ -	$ 39.99	
Total Capital Cost	$ -	$ 21,994,500	
Product Life (years)		15	
Amortized Capital Cost per Annum (A)	$ -	$ 1,466,300.00	
Soap Bars / Year**	73,000,000	6,600,000	
Oz / Soap Bar	2	4	
Total oz / Year	**146,000,000**	**26,400,000**	**82%**
Cost / Soap Bar	$ 0.04	$ 0.10	
Annual Cost of Soap Bar (B)	$ 3,000,000	$ 660,000	
Total Annual Cost (A+B)	**$ 3,000,000**	**$ 2,126,300**	**29%**

* We use Marriott as a case study of the Hotel Industry as we have information about their expenditure and bar soap use from Statistica and Forbes

** Data from Telegraph and assuming 1 bar of soap used per month if soap bar used to completion

5. Prototype Financial Analysis

	Quantity / Volume	Unit	Cost / Unit	Total Cost
*Housing**				**$ 110.22**
Upper Compartment (ABS-M30) (3D Printed)	11.04	in^3	$ 2.22	$ 24.51
Middle Compartment (ABS-M30) (3D Printed)	7.54	in^3	$ 2.22	$ 16.74
Lower Compartment (ABS-M30) (3D Printed)	7.61	in^3	$ 2.22	$ 16.89
Back Plate (ABS-M30) (3D Printed)	21.02	in^3	$ 2.22	$ 46.66
Push Button (ABS-M30) (3D Printed)	1.39	in^3	$ 2.22	$ 3.09
Grater Guard (ABS-M30) (3D Printed)	0.22	in^3	$ 2.22	$ 0.49
Width Controll (ABS-M30) (3D Printed)	0.33	in^3	$ 2.22	$ 0.73
Length Controll (ABS-M30) (3D Printed)	0.24	in^3	$ 2.22	$ 0.53
Height Controll (ABS-M30) (3D Printed)	0.26	in^3	$ 2.22	$ 0.58
Springs				**$ 46.68**
Width (Steel) (Purchased)	2	Pieces	$ 3.64	$ 7.28
Length (Steel) (Purchased)	2	Pieces	$ 6.79	$ 13.58
Height (Steel) (Purchased)	1	Pieces	$ 4.22	$ 4.22
Grater (Steel) (Purchased)	3	Pieces	$ 7.20	$ 21.60
Grater	1	Pieces	$ 14.99	**$ 14.99**
Attachment				**$ 2.24**
Command Strip (Foam) (Purchased)	2	Pieces	$ 1.12	$ 2.24
TOTAL COST				**$ 174.13**

6. Luxury Model Financial Analysis

		100,000-Unit Production Run		500,000-Unit Production Run	
	Quantity	Cost / Part	Cost / Unit	Cost / Part	Cost / Unit
*Housing**			**$ 16.53**		**$ 10.03**
Upper Compartment (ABS) (Injection Molded)	1	$ 2.40	$ 2.40	$ 1.01	$ 1.01
Middle Compartment (SS 304) (Die Casted)	1	$ 3.95	$ 3.95	$ 2.50	$ 2.50
Lower Compartment (SS 304) (Die Casted)	1	$ 3.15	$ 3.15	$ 2.65	$ 2.65
Back Plate (SS 304) (Die Casted)	1	$ 3.95	$ 3.95	$ 2.50	$ 2.50
Push Button (SS 304) (Die Casted)	1	$ 0.50	$ 0.50	$ 0.25	$ 0.25
Grater Guard (SS 304) (Die Casted)	1	$ 0.50	$ 0.50	$ 0.25	$ 0.25
Width Controll (ABS) (Injection Molded)	2	$ 0.38	$ 0.76	$ 0.16	$ 0.32
Length Controll (ABS) (Injection Molded)	2	$ 0.43	$ 0.86	$ 0.18	$ 0.36
Height Controll (ABS) (Injection Molded)	1	$ 0.46	$ 0.46	$ 0.19	$ 0.19
*Springs***			**$ 0.08**		**$ 0.06**
Width (Steel) (Purchased)	2	$ 0.02	$ 0.03	$ 0.01	$ 0.02
Length (Steel) (Purchased)	2	$ 0.02	$ 0.03	$ 0.01	$ 0.02
Height (Steel) (Purchased)	1	$ 0.01	$ 0.01	$ 0.01	$ 0.01
Grater (Steel) (Purchased)	3	$ 0.01	$ 0.02	$ 0.01	$ 0.02
*Grater****	1	$ 2.42	**$ 2.42**	$ 1.98	**$ 1.98**
*Attachment*****			**$ 0.10**		**$ 0.10**
Screws (Steel) (Purchased)	4	$ 0.03	$ 0.10	$ 0.03	$ 0.10
Total Cost of Goods Sold (COGS)			**$ 19.13**		**$ 12.17**
SGA	25%		$ 10.00		$ 10.00
Total Cost Inclusive of SGA			$ 29.13		$ 22.17
Sale Price			**$ 39.99**		**$ 39.99**
Gross Profit Margin Percentage			**52%**		**70%**
Net Profit Margin Percentage			**27%**		**45%**

* Calculations estimated using custompart.net
** Considering bulk pricing from Century Springs Corp.
*** Bulk order estimation
**** Bulk order estimation from Bolt Depot

7. Standard Model Financial Analysis

		100,000-Unit Production Run		500,000-Unit Production Run	
	Quantity	Cost / Part	Cost / Unit	Cost / Part	Cost / Unit
*Housing**			**$ 13.62**		**$ 5.72**
Upper Compartment (ABS) (Injection Molded)	1	$ 2.40	$ 2.40	$ 1.01	$ 1.01
Middle Compartment (ABS) (Injection Molded)	1	$ 1.81	$ 1.81	$ 0.76	$ 0.76
Lower Compartment (ABS) (Injection Molded)	1	$ 1.87	$ 1.87	$ 0.79	$ 0.79
Back Plate (ABS) (Injection Molded)	1	$ 4.38	$ 4.38	$ 1.84	$ 1.84
Push Button (ABS) (Injection Molded)	1	$ 0.67	$ 0.67	$ 0.28	$ 0.28
Grater Guard (ABS) (Injection Molded)	1	$ 0.41	$ 0.41	$ 0.17	$ 0.17
Width Controll (ABS) (Injection Molded)	2	$ 0.38	$ 0.76	$ 0.16	$ 0.32
Length Controll (ABS) (Injection Molded)	2	$ 0.43	$ 0.86	$ 0.18	$ 0.36
Height Controll (ABS) (Injection Molded)	1	$ 0.46	$ 0.46	$ 0.19	$ 0.19
*Springs***			**$ 0.08**		**$ 0.06**
Width (Steel) (Purchased)	2	$ 0.02	$ 0.03	$ 0.01	$ 0.02
Length (Steel) (Purchased)	2	$ 0.02	$ 0.03	$ 0.01	$ 0.02
Height (Steel) (Purchased)	1	$ 0.01	$ 0.01	$ 0.01	$ 0.01
Grater (Steel) (Purchased)	3	$ 0.01	$ 0.02	$ 0.01	$ 0.02
*Grater****	1	$ 2.42	**$ 2.42**	$ 1.98	**$ 1.98**
*Attachment****			**$ 0.40**		**$ 0.40**
Command Strip (Foam) (Purchased)	2	$ 0.20	$ 0.40	$ 0.20	$ 0.40
Total Cost of Goods Sold (COGS)			**$ 16.52**		**$ 8.16**
SGA	25%		$ 7.50		$ 7.50
Total Cost Inclusive of SGA			$ 24.02		$ 15.66
Sale Price			**$ 29.99**		**$ 29.99**
Gross Profit Margin Percentage			**45%**		**73%**
Net Profit Margin Percentage			**20%**		**48%**

* Calculations estimated using custompart.net
** Considering bulk pricing from Century Springs Corp.
*** Bulk order estimation